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SONOMA COUNTY SOLID WASTE STABILIZATION STUDY

EMCON Associates

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This report documents the first 2 years of a 3-year demonstration projected sponsored by EPA and Sonoma County, Calif. The purpose of the project is twofold: (1) to investigate the stabilization of solid waste in a sanitary landfill by analyzing leachate, gas, temperature and settlement parameters, and (2) to determine the effect on solid waste stabilization of applying, under various operational modes, excess water, septic tank pumpings, and recycled leachate in a sanitary landfill. This report describes the investigation of the test site, construction, instrumentation, and site operations and discusses the data produced thus far through extensive monitoring. Tables and figures following this report summarize the detailed data presented in the appendices.

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to Sonoma County, California
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U.S. ENVIRONMENTAL PROTECTION AGENCY
1974

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TABLE OF CONTENTS

PAGE

I. INTRODUCTION 1

II. GEOTECHNICAL INVESTIGATION 3

III. PROJECT CONSTRUCTION 7

IV. INSTRUMENTATION 13

V. REFUSE COMPOSITIONAL ANALYSIS 14

VI. OPERATIONS AND MANAGEMENT 17

VII. MONITORING PROGRAM 19

VIII. DISCUSSION 22

REFUSE COMPOSITION 22

SAMPLING AND ANALYTICAL METHODS 23

REFUSE STABILIZATION 26

GROUNDWATER ANALYSIS 40

TABLES

1. Liquid Conditioning and Purpose of Cells 41
2. Refuse Moisture Content Summary 42
3. Refuse Composition Summary 43
4. Composition of Refuse 44
5. Solution Analysis 45
6. Cell C Leachate - Electro-Conductivity/ Parameter Ratios 46
7. Cell D Leachate - Electro-Conductivity/ Parameters Ratios 48
8. Companion Thermister Comparison 50
9. Trace Metal Concentrations in Leachate-Cells A, B, & E 51
10. Trace Metal Concentrations in Leachate-Cell C 52
11. Trace Metal Concentrations in Leachate-Cell D 53

FIGURES PAGE

1. Location Map 54
2. Geologic Map 55
3. Exploration Map 56
4. Field Density Test Location Map 57
5. Site Plan (as Built) 58
6. Section A-A, Site Plan 59
7. Section B-B, Site Plan 60
8. Clay Barrier 61
9. Typical Instrumentation Location Plan 62
10. Plot of Alkalinity vs. Time - Cells A-E 63
11. Plot of Volatile Acids vs. Time - Cells A-E 63
12. Plot of B.O.D. vs. Time - Cells A-E 64
13. Plot of C.O.D. vs. Time - Cells A-E 64
14. Plot of Total Dissolved Solids vs. Time - Cells A-E 65
15. Plot of Electro-Conductivity vs. Time - Cells A-E 65
16. Plot of Chloride vs. Time - Cells A-E 66
17. Plot of Sulphate vs. Time - Cells A-E 66
18. Plot of Phosphate vs. Time - Cells A-3 67
19. Plot of Nitrate vs. Time - Cells A-E 67
20. Plot of Nitrogen-Ammonia vs. Time - Cells A-E 68
21. Plot of Nitrogen-Organic vs. Time - Cells A-E 68
22. Plot of Sodium vs. Time - Cells A-E 69
23. Plot of Potassium vs. Time - Cells A-E 69
24. Plot of Calcium vs. Time - Cells A-E 70
25. Plot of Magnesium vs. Time - Cells A-E 70
26. Plot of ph vs. Time - Cells A-E 71
27. Plot of Iron vs. Time - Cells A-E 71
28. Plot of Fecal Coliform vs. Time - Cells A-E 72
29. Plot of Fecal Streptococci vs. Time - Cells A-E 72
30. Plot of Cumulative Leachate Production - Cells A, B and E 73
31. Plot of Cumulative Water Distribution & Leachate Collection-Cell C 74
32. Fluid Routing - Cell C 75
33. Fluid Routing - Cell D 76
34. Plot of Temperature vs. Time - Middle Thermister, Cells A-E 77
35. Plot of Temperature vs. Time - All Thermisters, Cell A 77
36. Plot of Temperature vs. Time - All Thermisters, Cell B 78
37. Plot of Temperature vs. Time - All Thermisters, Cell E 78
38. Plot of Temperature vs. Time - All Thermisters, Cell C 79
39. Plot of Temperature vs. Time - All Thermisters, Cell D 79
40. Plot of Gas Composition vs Time - Cells A-E 80
41. Settlement - Cells A-E 81

APPENDICES PAGE

A. Field Exploration and Laboratory Testing 82

B. Test Cell Construction Data 93

C. Clay Barrier Construction Data 102

D. Instrument Details 105

E. Refuse Compositional Data 112

F. Monitoring Schedules 124

G. Analytical Methods and Procedures, etc. 131

H. Monitored Data 157

I. Test Cell Refuse Placement History 218

BIBLIOGRAPHY 224

PREFACE

Sanitary landfilling involves (1) the placement of refuse in a manner which will not degrade the land-water-air environment of the disposal site, (2) the compaction of the refuse to the smallest practical volume, (3) the daily covering of the refuse with a layer of earth and (4) the performance of disposal operations without creating nuisances or hazards to the health and safety of the surrounding community.

Once disposed of in a sanitary landfill, the refuse presents a potential source of pollution for a period of 10's to 100's of years. The introduction of large quantities of water into the sanitary fill either by acts of nature such as floods and rising groundwater or by negligence of man through inadequate grading, drainage, or maintenance of the earth cover can release pollutants from the decomposing refuse to contaminate the groundwater and surface waters.

The study discussed in this report was conceived to test the hypothesis that stabilization of refuse in a sanitary landfill can be accelerated by the controlled application of water thereby reducing the period of time during which the landfill presents a potential source of pollution and the risk that such pollution might occur.

The stabilization of household refuse in a sanitary landfill is being investigated in five large-scale field test cells. The refuse in the test cells is subjected to various moisture conditions and mediums through the controlled application of excess water, septic tank pumpings and recycled leachate. The stabilization of the refuse is measured by monitoring and analysis of leachate, gas temperature and settlement of the sanitary landfill. In addition, the groundwater in the vicinity of the test cells is tested periodically to detect any significant change of groundwater quality.

This study is funded principally by the Environmental Protection Agency under Demonstration Grant No. G06-EC-00351 of the EPA Office of

Solid Waste Management Programs. Partial funding of the 3 year demonstration project is provided by the County of Sonoma, Project Sponsor.

Project Management

Mr. Donald B. Head, Director of Public Works, County of Sonoma is Project Director. All project activities are directly supervised by the Assistant Director of Public Works for Sonoma County, Mr. Duane Butler. Project Engineer assisting Mr. Butler is Mr. Johnny Conaway.

Emcon Associates, Consultants in Waste Management, provides technical direction and input to the project, as well as the laboratory testing and analysis. Their services are under the direction of Project Manager, Mr. John G. Pacey. Dr. James Leckie of Stanford University provides biological-chemical consulting expertise through Emcon Associates.

Acknowledgments

Among those who contributed significantly to the study were the staff of the Environmental Protection Agency in Cincinnati, Ohio; the State of California Department of Public Health; the State of California Department of Water Resources; the County of Sonoma Sanitation Department; and students of Sonoma State College and Santa Rosa Community College.

I - INTRODUCTION

The investigation which forms the subject of this report was authorized under a three-year demonstration grant project sponsored by EPA and the County of Sonoma, California. The purpose of the project is twofold:

1. To investigate the stabilization of refuse in a sanitary landfill by analyzing leachate, gas, temperature and settlement parameters.
2. To determine the effect on refuse stabilization of applying, under various operational modes, excess water, septic tank pumpings and recycled leachate to a sanitary landfill.

The stabilization of refuse is monitored in five instrumented field scale test cells. Each test cell is subjected to a different controlled moisture condition and/or liquid character. The liquid conditioning and purpose of each cell are set forth in Table 1.

This report documents the site investigation, construction, instrumentation and site operations and presents and discusses data generated during the initial two years of the three-year demonstration grant project.

The work completed to date was conducted jointly by the staffs of Sonoma County Department of Public Works and Emcon Associates, the County's consultant, and includes the following:

1. Geotechnical investigation of test site.
2. Construction and instrumentation of clay barrier.
3. Design and construction of five field scale refuse test cells and various monitoring instruments and facilities for distribution, collection and storage of leachate and water added to, or withdrawn from the test cells.
4. Compositional analysis of refuse placed in the test cells.
5. Monitoring of refuse stabilization parameters, including leachate and gas composition, temperature and settlement.

6. Monitoring of selected groundwater parameters to determine the effect of the project on the quality of the groundwater.
7. Development of leachate and gas sampling and analytical procedures.

During the first six months of the study, the geotechnical investigation of the test cell area was accomplished, the test cells were constructed, refuse placed, and the cells were covered. From that time data has been collected on a scheduled basis concerning refuse settlement, cell temperatures, gas composition and leachate composition, as well as external parameters concerning groundwater quality. Mean temperature, rainfall, evaporation, storm runoff and quantity of liquid added to and withdrawn from each demonstration test cell are also monitored.

The first two years of the study were completed in accordance with the methodology and scope of work set forth in the demonstration application. It is expected that the third year program will follow the same pattern and that trends now becoming apparent will continue during the forthcoming year.

Discussion presented in this report follows the sequence in which the activities occurred, namely the first portions of the report describe the geotechnical investigation and construction activities followed by a discussion of instrumentation, compositional analysis of the refuse, pertinent operations and management procedures and the monitoring program. The main thrust of this report is a discussion of refuse stabilization as measured by extensive monitored data. Tables and figures following the text of this report summarize the detailed data presented in the appendices.

Readers wishing to examine closely the quantitative data will find this information in the appendices following the main body of this report.

II - GEOTECHNICAL INVESTIGATION - TEST CELL AREA

Scope of Work

The initial work element for the demonstration grant was a geotechnical investigation of the test cell area located within the Central Disposal Site in Sonoma County, California. The purpose of the investigation was (1) to determine the material types and conditions underlying the test cell area, (2) to determine the suitability of the site for the proposed use, and (3) to prepare appropriate recommendations concerning the geotechnical aspects of the research program.

The scope of work completed in this investigation included a surface and subsurface investigation, a review of geologic and engineering data, laboratory testing of selected soil samples to determine the pertinent physical and mechanical properties of the foundation materials, and the evaluation of this data to determine the suitability of the area for the intended program.

Site Description

The Central Disposal Site is located in the southwestern portion of Sonoma County, approximately 45 road miles north of San Francisco, California. (See Figure 1) The site consists of approximately 400 acres of sparsely-wooded grazing land in the well-rounded foothills of the Northern Coast Range. It is located well away from the path of urbanization, within a relatively short travel distance of central service areas. An improved all-weather road leads to the large central canyon. This canyon will provide capacity for disposal of solid waste generated in Sonoma County well beyond the year 2000.

An area for the test cells was selected about midway up the central canyon in a relatively flat portion of the valley, just east of the main drainage channel, (see Figure 2.). A small tributary drainage channel passes through the test cell area bisecting it approximately in half, with three cells located to the north and two to the south of the tributary channel.

Placement of sanitary fill at the Central Disposal Site commenced in the main canyon just above (north) the test cell area. Landfilling will proceed up the canyon away from the test cells. The test cell area should therefore be available for uninterrupted research activities for many years to come.

Geology

The Central Disposal Site is underlain primarily by marine sediments of the Franciscan Formation, (see Geologic Map, Plate 2). These Jura-cretaceous rocks consist of sandy clayey shale with interbedded sandstones and silicic chert beds. Geologic structure in the Franciscan Formation sediments is extremely complex reflecting a turbulent history of faulting, folding and shearing. The trend of this bedrock system is generally northwest-southeast through the Northern Coast Ranges of California.

The surface and near-surface deposits within the valley protions of the site contain relatively thin deposits of poorly-consolidated sediments of younger Merced Formation. The Merced Formation rocks are of Plio-Pleistocene Age and consist essentially of gravelly sandstones with interbeds of sandy clay and silt. The basal portion of the Merced Formation contains a zone of well-indurated impervious volcanic tuff breccia. Sediments of the Merced Formation have been deposited on an old erosion surface (valley) of the underlying older Franciscan Formation. The poorly-consolidated sediments of the Merced Formation are relatively undisturbed as indicated by their near-horizontal attitude and uninterrupted continuity.

Subsurface Exploration

Five exploration trenches were excavated in the test cell area in order to examine foundation soil types and conditions and thereby determine the most suitable location for the cells from the standpoint of geology.

The locations of the trenches are shown on Figure 3 and the logs of soils encountered in the trenches are presented in Appendix A. In general, the materials encountered in the excavation were comprised of sandy and silty clays and clayey sands. Some gravel was encountered in each trench and free water was observed in trench 4.

Groundwater

Sedimentary rocks of the Franciscan formation are considered to be essentially barren of fresh water. Locally, however, these well-consolidated rock units contain small supplies of poor to fair quality water which is used for domestic and stock water supply. The more successful low-yield wells tap water supplies in deeply-weathered or highly-fractured rock. These marginal supplies of poor quality water do not constitute a protectable resource. Sediments of the Merced Formation contain groundwater of moderate to high quality in the more pervious strata. This water is contained in beds of sand, lenses of gravels and occasionally in lenses of permeable volcanic rock.

Groundwater was encountered in thin beds of clayey sand and gravel just above the basal tuff breccia in each of the drill holes in the canyon bottom areas. This aquifer ranged in thickness from two to ten feet and occurred from 15 to 25 feet below ground surface. The groundwater encountered in this formation was confined by overlying clays of low permeability and artesian pressure heads ranged from ten to nearly twenty feet in exploration drill holes. Production capacities from wells in this thin stratum are estimated to be marginal, but known hydraulic continuity between this aquifer and major production aquifers to the south established the absolute need to prevent pollution of this aquifer by harmful materials originating in the refuse fill.

In addition to the subsurface groundwater, at least one perennial and two intermittent springs exist in the large canyon at the upper end of the Central Disposal Site. The backhoe investigation in the test cell area revealed little groundwater within twelve feet of the ground surface.

Laboratory Investigation

Representative soil samples recovered from the exploration trenches were tested in the laboratory to determine their physical and mechanical characteristics. Test data are presented in Appendix A. Based on the results of these laboratory tests, it was concluded that the clay soils possess a permeability of less than one foot a year and soils excavated for construction of the test cells can be readily recompacted.

Conclusions

Based on the results of the field and laboratory investigation, we determined that the test cell area was suitable for the research test cells. It was decided that excavations for construction of the test cells should terminate within the upper sandy clay and clayey sand materials of low permeability. Application of this criteria, tempered by drainage considerations and evaluation of the cut-and-fill material balance, resulted in the siting of the test cells at the locations shown on the plans.

The native soils in their existing state were considered generally satisfactory for retaining any leachate developed during excavation of the test cells. Occasional lenses or layers of more previous water-bearing soils were expected in the cell excavations. Such areas were to be over-excavated two feet and an impervious clay lining was to be placed to restore the test cells to design grade. Material generated from excavation of the cells was considered suitable for construction of the embankment portion of the test cells. The resulting test cells would thus be relatively impervious and capable of retaining leachate and gas.

III-PROJECT CONSTRUCTION

Project construction generally proceeded as originally designed and presented on the drawings which accompanied the demonstration grant application. However, some design modifications were made during construction to meet changed conditions and reflect additional decisions. Final construction details are shown on Figures 5, 6 and 7 "As Built" drawings.

CELL CONSTRUCTION

Excavation

The test cells were excavated to design grade and the material removed was stockpiled adjacent to the cells.

Some groundwater was encountered in the excavation of Cells A and E. As a consequence, the subsurface drains above Cell A and E and above Cells B through D were installed prior to construction of the embankment.

After excavation to design grade, the ground surface was inspected to determine the presence of any pervious lenses within the cell configuration. A thin zone of pervious material was encountered in Cells A and E. This material was removed by over-excavating two feet. This area was then restored to design grade with a two-foot-thick layer of compacted clay.

Embankment

The embankment areas of the test cells were first stripped of all surface organic matter. The ground surface was then scarified and compacted. The stockpiled material from cell excavation was utilized as embankment fill and was placed in lifts of six inch uncompacted thickness. The lifts were moisture conditioned as necessary to achieve proper compaction and compacted by numerous passes of a 5 x 5 sheepsfoot compactor drawn by a D-7 tractor and a Buffalo Springfield steel wheeled compactor.

Field density tests were taken during the placement operation to determine the relative compaction of the embankment materials. Results of the field density tests and laboratory control curves are presented in Appendix B.

When the downhill embankment had been constructed to a level two feet above the floor of the cell, trenches for the leachate collection lines were excavated in the bottom of the cell and a trench was excavated through the embankment for the leachate line discharging to the collection tank. Leachate collection lines were placed in the trenches and backfilled. The trench through the embankment was backfilled with a combination of native soil and 10% bentonite, by weight, in order to assure an impervious backfill. The embankments were then raised to design grade. A shallow trench was excavated on the inside slope from the top of the embankment to the base of the cell for installation of the lysimeter and gas collection lines.

Leachate Collection System

After the cells were excavated and graded and the embankments had been constructed to an elevation two feet above the base of the cells, trenches were excavated in the base of the cells and through the embankments for placement of the leachate collection lines. Pea gravel was placed around the collection lines in Cell C and D.

All collection tanks were positioned below the test cells with the top of tank below the base of the test cells, thereby assuring positive drainage of leachate into the collection facilities.

In Cells A and E a single leachate collection line was installed across the lower (west) side of the base as only a small quantity of leachate was expected. A full system of leachate collection lines was installed in Cells B through D to collect the large quantities of leachate expected from these cells. Cell B was expected to develop a considerable quantity of leachate only during the initial charging to field capacity. Nevertheless, the quantity expected was such that a full collection system was installed.

Refuse

Refuse was initially dumped at the edge of the cell and then pushed into the cell and spread by a D-7 dozer. The dozer compacted the refuse in a manner similar to the procedures that would be used in the normal sanitary landfill operation.

All incoming refuse was weighed. Samples of the refuse were obtained for compositional analyses in accordance with accepted statistical sampling methods. The samples were hand sorted into appropriate waste categories in a covered work area within five miles of the job site.

Granular Materials

Granular materials were used as backfill in the leachate collection trenches and for distribution material between the distribution lines and refuse in Cell C and D. Mechanical analyses of potentially suitable materials were performed prior to cell construction (See Appendix B). Concrete sand and muck sand from Basalt were accepted for the silty sand and concrete sand requirements. Pea Gravel was substituted for the proposed fine soil backfill material on leachate collection lines in Cells C and D and for material placed between refuse and distribution lines in Cell D. This substitution was made to avoid the filtering action that might occur when leachate passes through fine soil.

Cover Material

Cover material generally consisted of the stockpiled sandy clay material from cell excavation. The cover material was placed as a two-foot capping over the refuse in Cells A, B and E. A one-foot thickness of permeable material was placed between the refuse and sandy clay cover in Cell C and D to facilitate distribution of water and leachate. In Cell C this one-foot of material consisted of a layer of fine silty sand placed directly overlying the refuse. A six-inch mound of concrete sand was placed around the liquid distribution lines installed between the silty sand and cover material. A 12-inch layer of pea gravel (in lieu of silty sand) was placed between the refuse and cover material in Cell D to minimize any filtration of leachate.

The sandy clay was spread in one-foot lifts and compacted by numerous passes of a D-7 dozer. Two-inch-diameter holes were augered through the cell cover at intervals of 10 feet to permit measurement of the in-place thickness of cover material. The cover thickness measurements for all cells are presented in Appendix B.

Leachate Distribution System

As previously mentioned, a twelve-inch layer of pea gravel was placed over the refuse in Cell D in lieu of the originally planned fine silty sand spreading medium. Elimination of the spreading medium necessitated further changes in the distribution system for Cell D to assure uniform application of recycled leachate over the refuse. The changes consisted of the installation of two separate leachate distribution systems utilizing eight lines each with lines more closely spaced than the originally planned eleven line system. The decreased total footage in each system made necessary an increase in the size of the small discharge holes to maintain planned distribution rates. This had the side benefit of reducing the potential for plugging of the holes by solids in the leachate.

Clay Barrier Construction

An impervious clay barrier was constructed across the lower end of the central canyon, below (south) of the test cells and central disposal areas, to block the subsurface escape of leachate and gases which might emanate from the sanitary landfill and test cells. See Figure 8 for maximum cross section.

Native sandy clay soils were excavated to bedrock in preparation for construction of the barrier. Conditions encountered in the excavation were as originally estimated with the maximum depth of excavation being 30 to 35 feet below the valley floor or approximately 20 to 25 feet below the canyon creek channel. The excavation was inspected by Mr. Jack McCollough, the Engineering Geologist involved in the original investigation of the valley, and Mr. John Pacey, Consulting Engineer for the construction phase of the grant project.

A sump was excavated at the low point of excavation on the downstream side of the barrier excavation and backfilled with granular material. A perforated pipe was installed in the sump and extended to the natural ground surface to permit future removal of seepage waters collected in the drainage blanket, if required.

The barrier was constructed by backfilling the excavation with sandy clay soil obtained from the excavation. The fill material was spread by a D-8 Caterpillar Tractor in relatively thin lifts which were moisture conditioned as necessary to permit achievement of the required relative compaction and compacted by numerous passes of a 5 x 5 Sheepsfoot roller drum pulled by a TD-24 tractor. A sand drainage blanket was placed between the downstream face of the clay barrier and natural ground.

A moisture-density curve was developed in our laboratory to establish relative compaction parameters for the backfill material in accordance with ASTM Test Designation D698-70. Field density tests were performed periodically during the filling operation at random locations. Test methods utilized included both the sand cone method (ASTM Test Designation D 1556) and the nuclear density test method (ASTM Test Designation D 2922-71). The field density test results and laboratory compaction curve are presented in Appendix C.

The barrier was constructed up to a point slightly above the stream channel elevation under the inspection and testing control of Mr. James Cleary of Emcon Associates. County personnel directed and inspected the placement of additional fill required to raise the grade up to the natural ground surface and to provide an aesthetically-pleasing finish ground surface. No tests were performed on this final

10 feet of fill, as this work was principally for aesthetic purposes. Nevertheless, precautions were taken by County Staff to assure that the material was properly moisture conditioned and compacted.

IV - INSTRUMENTATION

Stabilization of the refuse is monitored by instruments installed in the test cells and by testing of leachate and gas samples withdrawn from the cells at programmed intervals. Instrumentation installed for refuse stabilization data retrieval include gas probes, thermisters, settlement monuments and leachate collection facilities.

Evaporation, rainfall and Cell runoff data necessary to evaluate rainfall infiltration into the test cells, are recorded respectively by an evaporimeter, rain gauge and two flow meters. Additional flow meters connected at appropriate locations in the collection, discharge and distribution piping, record the daily application of water to Cell C and makeup water applied to Cell D, as well as the quantity of leachate produced by Cells C and D.

Instrumentation for obtaining groundwater samples and measuring its quality include observation wells installed downhill and uphill of the test cells and up-valley of the clay barrier, and lysimeters installed below each test cell. Groundwater levels within and beneath the clay barrier are monitored by piezometers.

Instrument locations and identification symbols used in recording data developed are shown on Figure 9. Detailed drawings of the instruments utilized are presented in Appendix D.

V - REFUSE COMPOSITIONAL ANALYSIS

The composition and moisture content of refuse placed in the test cells was determined by analyzing refuse samples selected by statistical sampling methods. The sampling schedule was derived by use of Random Sample numbers, as noted and shown on Plate E-1.

Sample Procurement Procedure

The weigh master marked the refuse trucks containing refuse to be sampled as it left the scale. Trucks marked for sampling were directed by the traffic dispatcher to deposit its load of refuse adjacent to the designated cell. A front loader scooped 300 or more pounds of refuse at random from this pile and loaded it into the bed of a pickup truck. The sample was then enclosed in a canvas tarp and transported to the sorting center which was located about 5 miles east in the county road maintenance yard at Cotati.

The sample was removed from the truck, placed on a thick black plastic ground cloth and sorted. Forty-two part-time employees, primarily students from Sonoma State College and Santa Rosa Community College, were employed to sort the refuse samples. Ten labelled 32-gallon trash cans with plastic liners were positioned around the sample. Two to six students classified, segregated and deposited the material in the trash cans. Approximately 10 man-hours were required to sort a sample. The material was sorted into the following 10 categories:

1. Food Waste
2. Garden Waste
3. Paper
4. Plastics, Rubber, Leather
5. Textiles
6. Wood
7. Metals
8. Glass
9. Ash, Rock, Dirt
10. Fines

After the sample was sorted, all cans in each category were weighed and recorded. The total weight of waste in each category is presented on Plates E2-E6.

Sorting Guidelines

1. Synthetic material was classified as a plastic.
2. Fines were defined as any material that would pass through a 1" sieve. No further classification was attempted.
3. Wood was wood material that had been processed at a mill, i.e., a 2x4 was classified as wood, but a tree limb or branch was classified as garden waste.
4. Food wastes included: bones, shells, feathers, and fecal material. Food wastes were scraped out of their containers and the container deposited into its appropriate category.
5. Labels were left on containers.

Moisture Determination

Samples of segregated refuse are bulky, take a long time to dry and generate an obnoxious odor while drying. Therefore, the small capacity ovens of the Sonoma County Soils Lab were not adequate to handle the large number of samples obtained. County staff therefore designed and built two drying racks that could hold 16-2 feet x 4 feet x 6 inch deep sheet metal trays. The racks were enclosed with sheet metal and heated by a propane-fired forced air heater. This system maintained a relatively constant temperature of 105° F, drying most samples in from 2 to 6 days.

All samples were weighed before being placed in the drier. The samples were subsequently checked and their weights recorded every morning and evening. When two consecutive recorded weights were equal, the sample was considered dry.

Data was obtained for two types of moisture samples:

1. Total Sample - A sample was extracted from the sorting sample as it was loaded onto the pickup truck at the test cells. This sample contained a representative amount of all constituents and was not sorted.

These samples were dried separately and the data is reported on Plates E7-E11 in the four left-hand columns.

2. Composite Sample - Samples of each of the ten constituents from each sorted sample were obtained and sealed in plastic bags. Four or more of these like category samples were combined for this drying procedure. In combining the samples only sequential samples were used and the constituent samples of one cell were never mixed with those of another.

   This data is reported on Plates E7-E11 in the ten right-hand columns. The samples from which the composite sample was generated are listed under the appropriate grouping.

VI - OPERATIONS AND MANAGEMENT

AUTOMATIC OPERATIONS

Liquid Collection and Distribution System

Cell C and D distribution and collection systems are controlled by a central timer that activates twice daily at pre-set intervals. Four standard house service water meters measure the quantity of liquids applied to and discharged from the cells. One meter measures the fresh water inflow to the Cell C distribution system. One meter is connected to the leachate collection tank discharge line of Cell C and records the quantity of leachate pumped from the collection tank and disposed of in the adjacent main landfill. A meter is installed in Cell D leachate return line and records the leachate recycled through Cell D. The final meter is on the fresh water system for Cell D and records the make-up water that is added to maintain the desired quantity of liquid recycled through Cell D.

Cell A & E leachate is metered by a house service water meter and discharged to the main landfill with an electric pump. Cell B leachate is discharged to a collection tank and the quantity is measured with a graduated bucket. The leachate is disposed of in the main landfill.

Storm Runoff Collection and Monitoring System

Storm runoff from Cell B and the combined runoff from Cells A & E is collected in swales constructed in the cell embankments and discharged through drainage inlets to collection tanks. The collection tanks discharge through Sparling low pressure line meters which record the runoff quantity.

MONITORING AND MANAGEMENT

The site is inspected daily by disposal operation's personnel to check for any vandalism, theft or equipment malfunction. An office engineer visits the test cell site weekly for a detailed check on all systems and to record the monitoring data. His duties are:

1) Record all meter readings.
2) Check, retrieve and replace charts on the recording evapor-meter and rain gauge.
3) Test the discharge rates for Cell C and D distribution systems.
4) Check and test automatic timing system.
5) Record meter readings on storm runoff metering devices.

MAINTENANCE

Although the Cell design and construction minimized the maintenance functions, three basic operational maintenance funtions remain:

1) Since water service is not available at the site, water is hauled by truck to a 6,000 gallon storage tank that supplies the daily water for Cell 'C' distribution and the makeup water for Cell D.
2) The distribution lines in Cells C & D have to be cleaned periodically.

   Cell C - The clear plastic tubing, connecting the discharge manifold pipe to the small diameter distribution pipe have to be cleaned of algae periodically.

   Cell D - The small diameter discharge holes in the distribution piping clog due to fungus growth caused by the leachate. These holes must be cleaned periodically.
3) The leachate generated from Cells A,B,C, E, and the adjacent sanitary landfill is pumped into the sanitary landfill. A 22-foot deep, 6-inch diameter gravel-packed well was drilled in the main landfill refuse and is presently accepting all excess leachate from this project. This construction is of a temporary nature and has to be checked and serviced because of line breakage due to landfill equipment operations.

VII - MONITORING PROGRAM

GENERAL

The monitoring program involves the collection of liquid and gas samples for field and laboratory testing and retrieval of data from instruments installed in and about the test cells and clay barrier.

Monitoring activities are carried out jointly by the staffs of Sonoma County Department of Public Works and Emcon Associates. Rainfall, evaporation, storm runoff and refuse settlement, as well as the metering of water and leachate flows into and out of Cells C and D are monitored by Sonoma County Staff. The staff of Emcon Associates collects and tests samples of leachate, gas, Cell C input water, and groundwater, and monitors lysimeters, thermisters and groundwater levels.

All monitored data is presented in Appendix H.

SAMPLING AND TESTING SCHEDULES

Sampling and testing of leachate and groundwater commenced in December 1971. In February 1972, a formal schedule for frequency of leachate, gas and groundwater sampling and analysis was adopted.

The initial and revised sampling and testing schedules are presented in Appendix F.

SAMPLE COLLECTION

Leachate, Groundwater, and Water Added to Cell C and D

Leachate samples are obtained at sampling valves located in the collection line just upstream from the leachate collection tank. The collection line discharges into the collection tank through a riser which extends above the elevation of the sampling valve. This arrangement minimizes the exposure of the leachate to the atmosphere.

The groundwater is sampled and tested to detect any contamination by leachate escaping from the cells. Groundwater samples are bailed or pumped from the observation wells and periodically collected from the Cell A subdrain outfall. Samples of water added to Cell C are obtained directly from the water distribution tank. The exposure of the groundwater samples to air during the bailing and collection process, although not desirable, is not considered detrimental to detection of contamination by leachate.

All samples of leachate and water are field tested for pH, dissolved oxygen and electro-conductivity. These tests require approximately 100 to 200 ml. samples. Samples scheduled for laboratory testing of parameters that deteriorate rapidly with time are treated with a compatible preservative. Samples are stored on ice from the time they are collected until they are delived to the laboratory. Upon arrival at the laboratory the samples are refrigerated until tested. Sampling and test procedures are discussed in detail in Appendix G.

Gas

Gas is pumped from the gas probes using a battery-operated Johnson-Williams Model SSP Combustible Gas indicator. Gas samples are collected in gas sample tubes. Sampling procedures and the gas analysis test method are presented in Appendix G.

Lysimeters

Lysimeters are sampled periodically by injecting compressed air through one of two 1/4 inch tubings connected to the lysimeter. The fluid sample is discharged from the second 1/4 inch tubing and collected for testing. Fluid collected is field tested for pH, dissolved oxygen and, when sufficient quantity is available, electro-conductivity.

Fluid Distribution and Leachate Production

Flow meters, installed at appropriate locations in the distribution and collection piping of Cells C and D, are read periodically to determine the quantity of fluid entering and leaving the cells.

VIII - DISCUSSION

REFUSE COMPOSITION

Refuse compositional analysis data is presented in Appendix E and is summarized in Table 2, Refuse Moisture Content Summary and Table 3, Refuse Composition Summary. Both moisture and weight percentage figures for the various waste constituents are quite similar for all cells. The average weight percentage of waste constituents from all cells are compared with similar compositional data for the City of Berkeley, California*, the County of Santa Clara, California* and a study by Dr. Pohland at the Georgia Institute of Technology, in Table 4. The average values determined for the various waste constituents in the Sonoma County study are reasonably similar to the values developed for the City of Berkeley and the County of Santa Clara. Each of the California studies differ significantly from Dr. Pohland's Georgia study in percentage of textiles, metals, glass and food wastes. Data from Dr. Pohland's study is included as several of his project objectives parallel objectives of this study.

The Sonoma study developed a somewhat lower percentage by weight of paper as compared to the City of Berkeley, Santa Clara County and Dr. Pohland's study figures. Frequently, paper is reported in the literature as comprising over 45 percent of the total waste.

REACTIVITY OF CELL CONSTRUCTION MATERIAL

In order to establish the reactive character of the granular material, 20 gram samples of material were placed in distilled water in 300 ml. BOD bottles. Four sample bottles were prepared for each of the three granular materials. A schedule was established to test the water at time intervals of one week, six months, one year and two years, respectively. The tests include pH, alkalinity, Na, K, Ca, Mg and electrical conductivity determinations.

Test results to date (Table 5) indicate that only insignificant quantities of dissolved materials are contributed by the granular materials used in the test cells. The general composition of water in continual contact with the granular materials appears to be stable in each case except for pH. No explanation is offered for the increase in pH, however, it is unlikely that the change in pH in the test solutions would influence the composition of the leachate materials.

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* "Comprehensive Studies of Solid Waste Management, 1st and 2nd Annual Reports" , prepared by C. G. Golueke and P. H. McGauhey, Public Health Service Publication No. 2039, 1970.

SAMPLING AND ANALYTICAL METHODS

General

Experience with sampling procedures and analytical methods on numerous samples of leachate has necessitated changes in both sampling techniques and analytical methods. The need for such changes was generally anticipated, but it was not possible to specifically predict them as leachate exhibits a complex and changing nature.

The following general statements can be made about analytical methods as related to leachate tests:

1. The analytical philosophy should be one of attention to accuracy rather than precision.
2. The analysis is made difficult by the danger of interferences due to the high concentration of solutes and the changing nature of the leachate.
3. Colormetric methods are generally not applicable due to the complex nature of the solution and the high background color of undiluted leachate samples.
4. It is not possible to analyze for calcium and magnesium on undiluted leachate samples using the normal EDTA titrimetric technique due to masking of the end point by background color.
5. On undiluted leachate samples, it is necessary to use a potentiometric titration technique for chloride utilizing an Ag/AgCl electrode because of color interference.
6. The concentrations of most common constituents in leachate are generally very high and require dilution prior to analyses.

Total Suspended Solids

Analytical measurement of total suspended solids (TSS) in leachate

samples is subject to possible error because of the oxidation of reduced iron and manganese and the subsequent precipitation of ferric hydroxide and manganese dioxide in the sample. Depending upon the sequence of sampling and the care of analyses, experience has shown that an inordinate variation in measured total suspended solids (TSS) results. (see tabulated data in Appendix H).
Our experience has shown that when proper care is taken to avoid the formation of precipitate in the sample that TSS is generally low (<50ppm).

Considering that great care must be taken at all points in the handling of the sample to avoid introduction of oxygen prior to measurement of TSS and also that the data are marginal in terms of interpretive value, measurement of TSS in leachate is not recommended and has been discontinued.

Color

Quantitative measurement of color is useful only to the extent that it measures the relative intensity of this parameter and may be correlateable with other more meaningful measurements. Since even slight turbidity (suspended solids) causes the apparent color to be noticeably higher than the true color, it is necessary to remove suspended material before true color can be approximated. Removal of suspended solids is normally done by centrifugation.

Measurement of color in leachate samples is somewhat complicated by the fact that diffusion of oxygen into the leachate sample causes the oxidation of reduced Fe and Mn solution species and, hence, the precipitation of the hydroxide and dioxide, respectively. The formation of small, colloidal solids interferes with the color measurement, and due to the high concentration of reduced iron (and probably Mn) in solution it is necessary to either (1) prevent oxidation and precipitation from occurring or (2) allow complete oxidation and precipitation to occur and remove the precipitate by centrifugation.

The first procedure, preventing diffusion of oxygen into the sample, requires care in handling of the sample at all points of transfer prior to analysis. The second procedure, is more time consuming than the first and may still result in very small colloidal particles remaining in solution despite centrifugation. Given the limited value of the color measurements to begin with and the handling problems discussed above, measurement of color in leachate is not recommended and has been discontinued.

Electro-Conductivity Ratios

Selection of the degree of dilution required for various analytical tests is complicated by the changing nature of leachate as a function of time and site. Since electro-conductivity (EC) is essentially a measure of the concentration of dissolved ions in solution, there is a strong possibility that a correlation between EC and major ionic species can be made. The correlation between EC and other chemical parameters has therefore been investigated as a possible aid in predicting a proper dilution ratio.

Results utilizing the data available indicate the EC ratios may prove of value in estimating dilution requirements for some parameters. Ratio data for leachate from Cells C and D are presented in Tables 6 and 7. Especially good correlation is found between EC and alkalinity, chloride, BOD, COD, Na and K.

Somewhat greater scatter is seen for the data on calcium and magnesium. The scatter in data on sulfate is expected since SO_4 is a reactive compound under reducing conditions and hence should not be expected to follow EC values consistently.

Except for magnesium and sulfate the EC ratios for the two cells are surprisingly close. This indicates that, at least for these few parameters, EC ratios can be used effectively in estimating concentrations for dilution in the laboratory. This may be especially useful in cases where spot samples are brought in for analysis with no prior information on the leachate composition.

Gas Analyzer

In addition to its use as a pump to withdraw gas samples from the gas probes, the gas analyzer also registers explosibility of the gas. Although the value registered is not used to determine precise percentages of gases present, the instrument can be used to detect the presence of combustible gases.

Thermisters

In order to establish that thermisters installed within the gas probe conduits register temperature representative of the refuse at that location, thermisters were installed both inside and outside the top gas probe in Cell B. No appreciable difference in temperature was registered by thethermisters. The comparative data is presented in Table 8.

Gas Sampling

The initial gas samples obtained 12-8-71 were collected in large evacuated sample bottles and are considered to be uncontaminated samples. These test results are therefore reliable. Samples taken between 1-3-72 and 3-14-72 were collected utilizing a flushing technique which resulted in collection of samples contaminated with atmospheric air. Subsequent modification of the sampling technique to include evacuation of the sample bottle have eliminated this problem. Test results commencing 3-28-72 are considered representative of the gas produced in the refuse cells.

REFUSE STABILIZATION

General

Sanitary landfilling is now widely utilized for solid waste disposal and careful planning and the application of sound engineering principles to all facets of site selection, design, construction and operation help insure that the environmental impact is minimal and, in some cases, beneficial. With increased use and public awareness of this method of disposal, increased concern has also developed with respect to the pollution potential of leachate, its possible detrimental effects upon surface water and groundwater, and a realization that in some cases interception and treatment of this liquid may be necessary.

In spite of satisfactory landfill design and operation, leaching can and frequently does occur. This has been documented by field observations and case histories which indicate that leachate production is a most frequent problem in geographical areas which have relatively high annual rainfall. Limited data collected to date indicate that some leachates are extremely high in both organic and inorganic constituents and provide potential sources of significant amount of pollutants.

Examination of the leachate problem reveals that even in landfills containing only municipal refuse, a large number of variables interact to produce an unpredictable quantity and quality of leachate. A few of the relevant parameters affecting leachate quantity and quality are: annual rainfall, runoff, infiltration, mean annual air temperature, waste composition, waste density, initial moisture content, and depth of landfill. Additional variables are macro and micro nutrients, and toxic elements and compounds.

Studies of leachate composition indicate wide variation from site to site and at any give site with time. Adding to the complexity of the problem is the fact that leachate flow rates frequently vary widely over time at any one site.

This study has been designed to investigate the effect of several modes of operation upon the rate and extent of stabilization of municipal refuse in sanitary landfills. Five test cells have been constructed and subjected to the operational modes presented in Table 1. The modes of operation chosen for this study include: (1) addition of excess water to the refuse after refuse emplacement, (2) recirculation of leachate, and (3) addition of septic tank pumpings to the landfill materials.

The extent of refuse stabilization is being evaluated principally by monitoring leachate composition. Primary leachate composition parameters include BOD, COD, pH, alkalinity, volatile acids, phosphate and forms of nitrogen. In addition, electrical conductivity, temperature and various inorganic anions and cations are being monitored to define leachate composition. The time response of these parameters are presented in Figures 10 through 40. Following is a short discussion of the general effect of seasonal variation of rainfall infiltration and temperature after which each test cell is discussed separately with comparisons made to both the control cell and to literature information.

Rainfall Infiltration

The first rains of winter have relatively free access to the refuse through shrinkage cracks in the cell cover material. Natural swelling of the soil seals these cracks and thereafter the cover material is relatively impervious. The infilatration water influences the moisture content of the cells and, hence the process of refuse stabilization. Rainfall records (Figure 30) for the study site show that very little precipitation occured duriing the first winter (1971-72). Consequently, very little leachate developed as a result of infiltration. The second winter (1972-73) however, was a near-record year for the rainfall and leachate was developed in all cells, indicating significant infiltration. (Figure 30)

Cell D was a fully saturated system prior to the heavy 1972-73 winter rains and has been monitored on a continuous basis. Prior to the winter rains (before November 1972) the recycled leachate applied to Cell D was approximately 6,000 to 8,000 gallons per week (Figure 33). The maximum quantity of recirculated leachate put through the cell was approximately 37,000 gallons per week (February and March 1973). Although there may be some differences in infiltration rates between cells, it is reasonable to expect that significant infiltration occured in all test cells. The refuse in both Cells B and E was wetted to field capacity, but the cells have responded to the infiltrated volume of rain water in different manners (Figure 30). At the present time, it is not clear why the rate of leachate production is so different between Cells B and E, but the differences may be a combination of different permeability of the cover layer and differences in the rate of stabilization due to mode of operation. Cell E was originally seeded with 27,200 gallons of septic tank pumpings and also received 7,400 gallons of rainfall before the cell cover was placed. The cell gave early indications of vigorous anaerobic biological activity. Approximately 41,000 gallons of water were added to Cell B to bring it to field capacity before the top cover was applied (Table 1). When compared to control

Cell A, both Cells B and E show considerably more leachate produced.

Temperature Effects

Although chemical and biological processes are in general temperature dependent, both as to rate and ultimate equilibria, it is not reasonable at the present time to speculate on the effect of temperature on leachate composition other than in general terms. The multiplicity of chemical and biological processes occurring within a landfill are so complex as to preclude any attempt at rigorous treatment. On the other hand, observation indicates real differences in cell temperatures with time, depth and mode of operation.

In general, there is an apparent response of the upper several feet of landfill to the ambient air temperature while the deeper materials tend to show a much smaller thermal response. The effect of the ambient air temperature is significant to the extent of variation of the ambient air temperature over an annual seasonal cycle. The seasonal variations for this study indicate a range of some 20° C over the year. The thermal response of Cells A, B and E with depth over one and one half seasonal cycles is readily observed in Figures 35, 36 and 37.

In contrast, Cells C and D, which receive daily applications of liquid, show a pronounced thermal response over the whole depth with the seasonal cycle (Figures 37 and 38). This response over the whole depth of the cell reflects the fact that the temperature of the applied liquid tended to approach the mean ambient air temperature on the dates of application.

Cell A - Control Test Cell

Cell A was constructed in accordance with normal landfill practice and covered after the cell was filled with refuse with no artificial addition of moisture. Cell A serves as a control against which the other four cells are compared in terms of the effectiveness of the operation procedures on refuse stabilization.

Leachate and Gas Composition: The first significant quantity of leachate was collected from Cell A in October 1972. During this period the first rainfall of the winter was recorded. Prior to the rains the soil cover exhibited numerous random shrinkage cracks. Apparently a considerable volume of storm water infiltrated Cell A (see Figure 30) before the clay cover swelled, sealing the cracks.

Compositional data for leachate samples from Cell A prior to November 1972 indicate, in general, very low values for the compositional parameters when compared with leachate from other test cells. These low values prior to November 1972 may indicate that the initial leachate samples were condensate and, hence, did not carry the normal load of dissolved and suspended materials found in leachate. The volume of leachate collected prior to September 1972 also supports this hypothesis (Appendix H).

In particular, highly soluble electrolytes such as K, Na and Cl were found in low concentration until after heavy winter rains produced a significant quantity of leachate (Figure 30). Parameters showing marked increase after November 1972 are EC, TDS, Ca, Mg, SO_4, volatile acids and alkalinity. The pH remains low (pH 5) as expected because of the high partial pressure of carbon dioxide. As a consequence of the limited data little can be said about the activity within Cell A prior to October 1972, when production of leachate allowed consistent monitoring. Settlement data, presented in Figure 41, indicate that little settling occurred before the 1972-73 winter rains. In fact, a settlement deflection occurred between September and November 1972 commensurate with early heavy winter rains. Apparently, compaction within the cell occurred due to the infiltrating moisture.

Although both phosphorus (P) and nitrogen (N) levels are somewhat low in comparison to nutrient content in other leachates, they should be considered sufficient for biological activity. Biodegradation of organic material is proceeding as evidenced by the large partial pressure of CO_2 and the increase in volatile acids. Methane has been measured in low concentration (1% by volume), indicating the presence of methanogenic organisms, even though conditions in the cell are far from optimal.

Trace metals data (Table 9) indicate that Cd, if present, is consistently below the detection limits for the analytical methods used. Since the 1962 U.S. Public Health Service Drinking Water Standard is 0.01 ppm, below the detection limit of the analytical method employed, nothing can be said concerning Cd as a potential hazard using the Drinking Water Standards as a reference point. Cu has been found (Table 9) in the 0.1-0.2 ppm range which is an order of magnitude below the USPHS Standards. Zn, Pb and Hg, however, appear to be consistently present in the leachate in quantities above or near the Drinking Water Standards (USPHS Standards: Zn, 5 ppm, Pb, 50 ppb; Hg, 5 ppb). An analysis of the potential for contamination of groundwater by these metals must take into consideration the likely reactions between the leachate and the soil through which the leachate must pass to enter the groundwater aquifer and potential removal mechanisms such as ion exchange, absorption and precipitation.

Cell B- Field Capacity Test Cell

Cell B is different from Cell A only in the respect that 41,000 gallons of water were added to bring the cell up to field capacity before the cover material was placed. No additional management procedures have been used on Cell B.

Leachate and Gas Composition: The initial addition of moisture to Cell B was intended to bring the refuse moisture content to field capacity, thus allowing any subsequent addition of water to generate a proportionate amount of leachate. The cumulative record of leachate production for Cell B (Figure 30) shows the increase in leachate production resulting from early winter rains (9/72-11/72). The short duration of increased leachate production suggests that open cracks in the soil cover were apparently sealed due to swelling, once the cover material was saturated with moisture. Apparently, infiltration was significant prior to the natural sealing of the cell cover material.

Data on leachate composition must be separated into two time periods. The first is the period from 12/71 to 1/72 immediately after Cell B was brought to field capacity and the onset of the winter rains in October 1972. The second period covers the time interval starting with the winter rains of 1972-73 (10/72 on). Nothing significant can be said about data developed during the earlier period. This first set of data are scattered and generally reflect concentrations of components in leachates in the ranges reported in literature.

Data on leachate composition for the second time period reflect real changes and can be explained in terms of volume flow-through and biological activity within the cell. Generally speaking, it can be said that there continues to be anaerobic biodegradation within the cell, but no significant activity of methanogenic organisms. Gas composition (Figure 40) shows continued high CO_2 content with traces of CH_4. Consistent with the gas composition is the low pH, high alkalinity and volatile acids (Figures 26, 10 and 11, respectively). Apparently conditions within the cell necessary to reduce sulfate to sulfide in significant quantities have not developed, as is evidenced by the continued high SO_4 content (Figure 17).

Trends from October 1972 on, for all parameters (except pH and P) indicate a possible dilution mechanism acting to lower concentrations. This is especially evident in trends for TDS and EC, both of which reflect decreasing concentrations with time (Figures 14 and 15). Na, K, Ca, Mg and Cl, as well as volatile acids, alkalinity, BOD, COD, and organic nitrogen and ammonia (Figures 10 through 25) all reflect decreases in concentration commensurate with increases in total volume of leachate produced (Figure 30).

Trace metals data (Table 9 show compositions for Cell B similar to those for Cell A. Again, Zn, Pb and Hg tend to be at or above the USPHS Standards, while Cu generally is below 1ppm (except on 1/3/72). Cd has been detected only on 10/24/72 when the level was 0.19 ppm, well above the accepted USPHS Drinking Water Standard.

Cell C - Continuous Flow - Through Test Cell

Water is applied to Cell C at a rate of approximately 800 gallons per day. The general effects of this mode of operation are discussed below.

Leachate and Gas Composition: General time responses for leachate composition parameters indicate decreasing concentrations for all parameters (except pH). This general decrease reflects the basic flushing action of the water added to the cell. The rate of addition of water to Cell C was designed to 0.4 gal/ft^2 - day. Figure 31 presents the cumulative distribution and collection of liquid for Cell C. The slope of the distribution curve is 23.6 x 10^3 gal/month or 0.314 gal/ft^2 - day, slightly under the design capacity. The slope of the cumulative volume collected from Cell C is 16.65 x 10^3 gal/ - month or 0.22 gal/ft^2 - day, an average loss of about 34% which can be attributed basically to evaportranspiration.

The continuous steady application of water to Cell C has resulted in a moderation of the thermal response of the upper layers in the cell as is reflected in Figure 38. This thermal response is different for Cells A, B and E, and more closely resembles the thermal response of Cell D, where continuous recycle of liquid also seems to be reflected in a stable temperature profile through the depth of the cell (Figures 35 - 39).

Data on gas composition, BOD, COD and volatile acids indicate vigorous biological activity within the cell. In spite of the low pH (~5) methane is being produced at an increasing rate (10%+ on 3/73). These data indicate that either the internal pH is greater than the pH recorded for the leachate in the collection system, or there are pockets or volumes within the cell having different environmental conditions. In either case, it is apparent that methanogenic organisms are operating within the cell at an increasingly more efficient rate.

The vigor of the biodegradation processes is reflected in the increasing percentage of NH_3 - Nitrogen and decreasing percentage of organic nitrogen (Figures 20 and 21). The strength of the reducing conditions is reflected by the low level of NO_3 (Figure 19) and the smooth decrease on SO_4 (Figure 17). Sulfate, a strong anionic electrolyte under oxidizing conditions, would typically follow the same trends as Cl (Figure 16) which generally functions as a quasi-conservative material. However, under appropriate reducing conditions, sulfate is utilized as an electron acceptor and is reduced to sulfide during bio-oxidation of organic matter. The presence of CH_4 and decreasing SO_4 indicates strong reducing conditions.

Nutrient concentrations (P and N) indicate that sufficient quantities of nitrogen and phosphorus are available for biological growth. It appears that the flushing action will continue to remove nutrients from the cell and may eventually lead to nutrient limited biological activity.

The quantity of oxygen contained in the water added to Cell C may eventually affect the general composition of the leached liquid, but at the present time it appears not to be exerting a strong influence. There is the possibility that added water with substantial O_2concentration could be toxic to the anaerobic organisms present in the landfill. It is also likely that the oxygen would be consumed rather rapidly as the water moves through the cell depth and, hence, only the upper layer would be affected. This toxic behavior of oxygen would be reflected in the gas composition, generally causing a lower production of methane since molecular oxygen is known to be extremely toxic to methanogenic organisms.

Concentratipns of dissolved materials and electrolytes as reflected by the gross measurement parameters TDS and EC (Figures 14 and 15) show a rather smooth trend toward lower concentrations. Specific parameters such as Na, K, Ca, Mg and Cl reflect the same trends. The decreasing concentrations are compatible with vigorous bio-degradation since inorganic salts and refractory organic solutes are expected end products of the bio-oxidation process and should be easily washed out. The early data (first 6 months of data) showing high concentrations of electrolytes should reflect the flushing out of readily solubilized material leaving behind those materials requiring biodegradation.

Trace heavy metals data (Table 10) indicate that, except for Cd, all metals monitored are present in substantial quantities. The concentrations of these metals are high but compatible with a low pH and the presence of dissolved organic solutes which can act as chelates. Except for Zn, no trends are apparent. Zn concentrations are decreasing with time, indicating a flushing action. Zn, Pb and

Hg are all high when compared to USPHS Drinking Water Standards and pose a potential pollutional hazard to groundwater and surface water sources. Recognition of the potential hazard is important.

The rate of settling of Cell C (Figure 41) is more rapid than the rate of settling for Cell A, B and E. Cell C has had continual throughput of water and the data indicate accelerated compaction compared to control Cell A.

The presence of polychlorinated byphenyls (PCB) was detected on 3/2/72 at an 0.35 ppb level and 0.40 ppb on 3/28/72. However, none has been detected in subsequent analysis. Since there is no experience to allow prediction of time-concentration response for PCB's under the conditions present in the test cell, further monitoring of this parameter is justified at a reduced frequency. It should be noted that in the process of analyzing for PCB's, other chlorinated hydrocarbons have been detected. Specifically Lindane was found at the 0.06 ppb level on 12/28/71. No systematic appearance of chlorinated hydrocarbon pesticides is evident and hence does not appear to be a major concern.

The concentration of fecal coliform and fecal-streptococci (Figure 28 and 29) indicate a gradual die-off of these organisms in Cell C. It was expected that natural competition and inhibition processes would cause a reduction in the active organism level.

Cell D - Continuous Leachate Recycle Test Cell

Leachate is recycled and redistributed to Cell D at the rate of about 1,000 gallons per day. The time response of leachate and gas composition are discussed below for this mode of operation.

Leachate and Gas Composition: The fluid routing for Cell D over the test period is presented in Figure 33. It is evident that the volume of recycled leachate has deviated by at least a factor of 10 during the test to date.

Infiltrated rainwater added to the volume of leachate developed during the heavy winter rains of 1972-73 (Figure 32). The daily volume of recycled leachate varied from a low of about 500 gal/day (3500 gal/week) to a high of about 5,000 gal/day (37,000 gal/week). The surface loading rates for these daily volumes are 0.2 gal/ft^2 - day and 2 gal/ft^2 - day, respectively. Data on leachate composition indicate surprisingly stable concentration conditions.

Na, K, Ca and Mg show a leveling trend indicating that some control mechanisms may be operating on these alkali and alkaline earth metals. These four metals, usually quite soluble (at low PH values for Ca and Mg), show no major response to changes in volume during the period 10/72 to 3/73. TDS and, to some extent EC, also show a leveling trend commensurate with the data for Na, K, Ca, Mg, as well as Cl and alkalinity.

Continuous recycling of leachate in Cell D has moderated the thermal response of the upper layers in the cell as reflected in Figure 39.

Active anaerobic biological activity is suggested by data on gas composition, volatile acids and alkalinity. The production of CH_4 increased sharply during the summer of 1972 and was about 26% by volume on 9/72. These data suggest strongly that conditions within the cell are somehow accommodating methanogenic organisms and the pH measured in the collected leachate (pH 5 for Cell D) cannot necessarily be used as a criteria for viability of the pH-sensitive methanogenic organisms. The strong reducing conditions within the cell are reflected in the absence of any substantial nitrate (Figure 19), in the apparent reduction of sulfate (Figure 17) and in the continually high values for soluble reduced iron (Figure 27). Both NO_3 and SO_4 are utilized, sequentially, as electron acceptors during bio-oxidation of organic material under strong reducing conditions. The increasing percentage of ammonia compared to total nitrogen indicates a more complete degradation of organic matter. Substantial quantities of organic matter have apparently accumulated in the leachate as is reflected in the stable BOD and COD measurements (Figures 12 and 13).

The high values for organic and ammonia nitrogen and the concentration of phosphate indicate that these nutrients are not limiting to biological growth. The reduction in phosphate concentration with time may be indicative of bio-utilization of phosphate.

A balance of the major ions in solution can account for most of the TDS but the solution is sufficiently complex that it is doubtful whether any useful information can be gained by attempting a mass balance on the measured ions and TDS.

Heavy metals appear to be accumulating in the recycled leachate. Inspection of values in Table 11 for Cu, Zn, Hg and Pb indicate a rather steady concentration pattern with time. Cd does not follow this pattern within the detection limits of the technique used. Cu has accumulated to about 0.1 - 0.2 ppm levels, below the USPHS Drinking Water Standards. Zn (~20 ppm), Hg (~10 ppb), and Pb (~0.2-0.4 ppm) all are substantially above the USPHS Standards for these metals. The high organic content and low pH of the leachate solution are compatible with the rather high levels of trace metals.

The rate of settling of Cell D (Figure 41) is very similar to the settling rate for Cell C, both of which have a continual throughput of water. The settling indicates compaction and is consistent with the apparent biodegradation occurring in both Cells C and D. The maximum settlement to June , 1973 has occurred in Cells C and D with a magnitude of between 3 and 4 inches, or about 4 percent of the refuse thickness.

Polychlorinated biphenyls were detected once on 3/28/72 at the 0.2 ppb level. No subsequent analysis showed any PCB's to be present. Lindane, a chlorinated hydrocarbon pesticide, was detected at the 0.07 ppb level on 1/18/72. No subsequent analysis shows evidence for the presence of pesticides. Apparently most materials of this nature have been either degraded or are being retained within the cell and are not in the leachate at detectable levels.

Data for fecal coliform and fecal strep (Figures 28 and 29) indicate that there has been a gradual, but steady kill-off of these organisms for all cells, including Cells C and D. The data confirm the expected results of microbial competition and adaptation. The only surprising development is the fact that there is such little difference between Cell E and Cells C and D. Cell E, seeded with septic tank pumpings, might be expected to have substantially more fecal organisms than leachates from other cells.

Cell E - Biologically Seeded Test Cell

Cell E has been seeded with septic tank pumpings (27,200 gallons) to provide microbial seed material to accelerate biological degradation processes, and also to bring moisture content up to field capacity.

Leachate and Gas Composition: Only small volumes of leachate were produced in Cell E prior to October 1972. However, much the same as for Cells A and B, Cell E has responded to precipitation during 1972-73 winter by producing a considerable quantity of leachate (Figure 30). The cumulative leachate volume (Figure 30) for Cell E has a time response different from Cells A and B. It is not understood at present why the time response is so different. Data for Cell E shows a slow, smooth increase in leachate production during the heavy winter rains only tapering off after the precipitation of February, 1973. The most plausible explanation for these data is that the top soil cover of Cell E has a higher permeability compared to Cells A and B. A higher permeability would allow slow but continuous infiltration of rainwater into the cell and would not necessarily exhibit surface cracks. The less permeable soil with cracks would allow an immediate infiltration of rainfall, but once closed by swelling, it would be relatively impervious. The data can not be explained by other differences in Cell preparation or maintenance.

The general trend of all parameters for Cell E (except pH) appears to be toward increasing concentration. Initial pH values were around 6 and considered along with early gas composition and volatile acid data, it is apparent that biodegration of organic matter was accelerated due to the seeding with septic tank pumpings. However, it now appears that the early biological activity may have been at the expense of easily decomposable material since data collected since October 1972 indicate increasing volatile acids, alkalinity, BOD and COD (Figures 10-13) with a corresponding decrease in pH to about 5 (Figure 26). The increasing concentration of readily soluble salts such as Na, K, Ca, Mg, and Cl (Figures 16, 23-25) is reflected by parallel increases in TDS and EC over time (Figures 14 and 15). The general increase in concentrations can best be explained as a leaching of readily solubilized materials made available by the early biodegradation of organic matter. This explanation is supported by the opposite response to infiltration water in Cell B which, while brought to field capacity the same as Cell E, did not have the microbial seed to accelerate the biological processes.

No substantial change is evident in the gas composition which remains with substantial percents of CO_2 (90%+) and measurable CH_4 (2%+) Although anaerobic, the cell environment apparently is not yet sufficiently reducing to convert sulfate to sulfide as is evidenced by increasing concentrations of SO_4 (Figure 17). Even though the rate of production of leachate is different between Cell E and Cells A and B, the rate of settlement for these three cells is quite similar (Figure 41). Cell B was brought to field capacity prior to sealing, whereas Cell E was brought close to field capacity , Cell A was not moisture conditioned but received relatively small quantities of rainwater during construction of the cell.

The P and N nutrient levels (Figures 18-21) in Cell E leachate indicate that neither nutrient can be considered limiting by normal biological requirements. Although the specific nutrient requirements of the anaerobic microorganisms existing in the cell are unknown, it is safe to say that the nitrogen and phosphorus available in the leachate are at least an order of magnitude above minimal requirements.

Heavy metal content of Cell E leachate (Table 9) follows the same trend as for Cells A and B. Cd is either just at or below the detection limits of the analytical methods used and, when detected, is above the USPHS Drinking Water Standards. Cu is generally found at levels below 0.2 ppm, while Zn, Pb and Hg tend to be at or above the 1962 USPHS Standards.

GROUNDWATER ANALYSIS

The purpose of monitoring the quality of groundwater in close proximity to the test cells and down valley from the cells is to maintain a check on the effectiveness of the earth cells to prevent leachate from contaminating the underlying groundwater.

The data collected to date (Appendix H) indicate that the quality of the groundwaters taken from test wells 1 through 4 remain stable in terms of the parameters most likely to indicate pollution by leachate. The parameters most likely to indicate the presence of leachate contamination are those relatively conservative parameters (from the point of view of groundwater) such as Cl, Na, K, Ca, Mg, SO_4 and alkalinity. In addition, gross measurements such as TDS and EC are also valuable indicators of changes in composition. The data collected show no significant shifts in composition of the water in any of the wells.

TABLE 1

LIQUID CONDITIONING AND PURPOSE OF CELLS

CELL DESIGNATION	INITIAL		OPERATION		PURPOSE OF CELL
	LIQUID CONDITIONING	LIQUID USED	DAILY LIQUID APPLICATION gal/day	LIQUID USED	
A	None	None	None	None	Control Cell
B	Field Capacity*	Water	None	None	To determine the effect of high initial water content on refuse stabilization.
C	None	None	700± (200-1000)**	Water	To determine the effect of continuous water through flow on leachate character.
D	None	None	1000± (500-1000)**	Recircu-lated Leachate	To determine the effect of continuous leachate recirculation on leachate character.
E	Field Capacity*	Septic Tank Pumpings	None	None	To determine the effect of high initial moisture content, using septic tank pumpings, on refuse stabilization.

* Field capacity is the condition when a sufficient quantity of fluid has been added to the refuse to cause a significant volume of leachate to be produced from the cell.

** Range of variation in daily application of fluid.

TABLE 2

REFUSE MOISTURE CONTENT SUMMARY

ITEM	MOISTURE CONTENT - % OF DRY WEIGHT					
	CELL					Average of All Cells
	A	B	C	D	E	
Food Waste	NO DATA AVAILABLE	151	133	118	122	131
Garden Waste		67	99	102	91	90
Paper		29	28	38	36	33
Plastic, Rubber, etc.		21	20	15	20	19
Textiles		38	28	28	25	30
Wood		13	17	22	18	17
Metals		6	7	4	4	5
Glass, Ceramic		1	1	0	1	1
Ash, Dirt, Rock		10	26	15	13	16
Fines		47	47	47	51	48
TOTAL Random Sample Combined Waste	41	40	38	31	33	37

NOTE: Samples oven dried at 105° Fahrenheit

TABLE 3

REFUSE COMPOSITION SUMMARY

ITEM	PERCENTAGE OF TOTAL WEIGHT					
	CELL					Average of All Cells
	A	B	C	D	E	
Food Waste	8.8	10.4	12.8	9.7	12.0	10.7
Garden Waste	10.8	11.1	5.8	7.4	17.0	10.4
Paper	35.5	44.5	42.4	45.3	35.2	40.6
Plastic, Rubber, etc.	4.2	5.2	5.1	4.7	4.0	4.6
Textiles	1.1	1.4	2.5	1.5	1.9	1.7
Wood	1.3	1.2	0.6	1.3	0.4	1.0
Metals	8.0	9.9	8.8	9.5	8.6	9.0
Glass, Ceramic	9.1	9.8	11.5	12.4	11.5	10.9
Ash, Rock, Dirt	5.8	1.0	3.6	1.0	2.8	2.8
Fines	15.4	5.5	6.9	7.2	6.5	8.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 4

COMPOSITION OF REFUSE

SOURCE OF REFUSE / ITEM	WEIGHT PERCENTAGE			
	SONOMA COUNTY TEST CELLS CALIFORNIA	*SANTA CLARA COUNTY (a) CALIFORNIA	*CITY OF BERKELEY (b) CALIFORNIA	**DR. POHLAND GA. INST. OF TECH.- GEORGIA
Food Waste	10.7	12.0	25.1	25.0
Garden Waste	10.4	9.0		0
Paper	40.6	50.0	44.5	50.0
Plastic, Rubber,	4.6	3.0	2.2	3.0
Textiles	1.7	2.0	1.1	5.0
Wood	1.0	2.0	-	1.0
Metals	9.0	8.0	8.7	4.0
Glass, Ceramic	10.9	7.0	11.3	7.0
Ash, Dirt, Rock	2.8	7.0	7.1	5.0
Fines	8.3			0
TOTAL	100.0	100.0	100.0	100.0

(a) Estimated breakdown of domestic waste. Assumes a per capita production of 8 pounds per day of which 44% is domestic refuse.

(b) Refuse segregated and weighed at Berkeley Waste Disposal Site. Percentage figures are average of seven loads from districts established by income level and type of dwelling unit.

* Reference: "Comprehensive Studies of Solid Waste Management" First and Second Annual Reports. C. G. Golueke & P. H. McGauhey. Public Health Service Pub. No. 2039, 1970.

** "Landfill Stabilization with Leachate Recycle" Frederick G. Pohland, 3rd Annual Environmental Engineering & Science Conference, March 5-6, 1973, Louisville, KY.

TABLE 5

SOLUTION ANALYSIS

Silty Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	
Calcium	30	34	48	
Electrical Conductivity	500	500	600	
Magnesium	30	23	29	
Potassium	3.5	1.85	17.0	
Sodium	31	32	34	
pH	7.2	7.7	8.8	

Concrete Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	
Calcium	28	36	32	
Electrical Conductivity	500	500	500	
Magnesium	31	23	28	
Potassium	2.2	1.75	1.8	
Sodium	31	31.6	32	
pH	7.2	7.9	8.7	

Pea Gravel

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	180	190	190	
Calcium	33	54	40	
Electrical Conductivity	480	550	460	
Magnesium	26	16	25	
Potassium	1.9	1.95	2.0	
Sodium	31	29.6	31	
pH	7.3	7.3	9.2	

TABLE 6

CELL C LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-18-72	2.01	0.45	9.17	0.33	9.17	14.47	-	-	-	0.72
2-15-72	2.10	0.42	9.17	0.28	9.82	22.00	-	-	12.50	0.57
3-2-72	2.25	0.37	6.25	0.31	9.09	18.18	11.83	10.53	-	0.54
3-14-72	2.53	0.44	11.36	0.41	11.79	30.49	-	-	15.24	0.69
3-28-72	2.11	0.44	10.00	0.33	9.90	22.22	-	-	-	0.61
4-11-72	2.22	0.44	7.50	0.32	10.23	20.00	10.75	12.86	20.09	0.67
4-25-72	2.53	0.55	9.50	0.39	11.05	21.11	-	-	-	0.79
5-9-72	2.53	0.52	11.22	0.41	13.58	27.50	14.67	13.75	24.55	0.91
5-23-72	2.38	0.41	11.08	0.40	13.17	44.32	-	-	-	0.79
6-6-72	2.78	0.56	9.52	0.49	17.54	45.45	17.86	18.18	29.41	0.99
6-20-72	3.08	0.54	11.43	0.39	15.09	40.00	-	-	-	0.87
7-11-72	1.70	0.42	10.42	0.32	15.63	34.09	15.63	15.76	-	0.80
7-25-72	1.89	0.71	12.00	0.43	17.56	37.50	18.95	15.38	-	0.96
8-8-72	2.61	0.54	11.59	0.41	16.98	28.63	15.87	19.21	-	0.96
8-23-72	2.69	0.66	11.48	0.41	16.67	36.08	-	-	-	0.96
9-7-72	1.76	0.60	10.53	0.37	18.58	37.97	17.65	19.23	45.80	0.88
9-20-72	1.97	0.66	10.70	0.40	11.30	41.22	-	-	-	0.85
10-11-72	3.01	0.57	12.73	0.42	14.74	36.36	21.54	16.67	-	0.84
10-24-72	3.33	0.70	12.00	0.43	19.46	40.00	20.00	12.68	-	0.91
11-8-72	3.65	0.38	8.93	0.32	7.69	30.12	14.71	14.71	-	0.73
11-21-72	2.56	0.38	8.04	0.28	14.52	14.06	16.67	13.64	-	0.69
11-30-72	3.41	0.54	11.54	0.43	21.13	41.10	22.22	18.75	52.63	0.98
12-19-72	2.84	0.38	9.32	0.34	10.04	-	17.50	16.67	-	0.80

TABLE 6

CELL C LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-10-73	2.81	0.51	9.95	0.41	18.97	46.61	26.70	22.00	-	0.88
1-23-73	2.68	0.40	8.75	0.32	19.09	17.50	18.83	13.82	-	0.81
2-6-73	1.53	0.28	6.04	0.24	5.51	25.00	13.30	11.15	-	0.55
2-27-73	2.24	0.34	6.06	0.26	8.15	23.40	16.50	12.13	-	0.61
3-13-73	2.30	0.50	7.93	0.34	18.59	37.76	22.24	15.90	30.72	0.79
3-27-73	1.40	0.23	5.18	0.22	7.51	21.15	13.33	9.32	-	0.48
4-10-73	0.95	0.17	3.12	0.13	7.32	13.89	7.89	5.95	-	0.30
4-24-73	1.43	0.21	4.87	0.18	6.44	19.90	12.34	8.55	-	0.41
5-15-73	1.51	0.30	4.93	0.20	7.48	21.59	14.84	7.42	33.93	0.46
6-5-73	1.63	0.35	5.76	0.24	7.06	26.66	-	-	-	0.56
6-26-73	1.30	0.25	5.69	0.21	12.35	23.84	16.66	9.07	32.54	0.49
AVERAGE	2.28	0.44	8.93	0.34	12.74	27.88	16.60	13.89	29.74	0.75

TABLE 7

CELL D LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-18-72	3.93	0.59	7.69	0.13	9.92	21.43	13.19	12.24	-	0.57
2-15-72	2.47	0.53	8.46	0.42	10.68	22.00	-	-	10.58	0.77
3-2-72	1.88	0.41	6.43	0.30	9.18	18.00	12.16	10.00	-	0.55
3-14-72	2.02	0.50	10.00	0.40	11.76	26.67	-	-	13.04	0.75
3-28-72	1.98	0.44	7.69	0.31	9.80	20.00	-	-	-	0.59
4-11-72	2.02	0.46	11.11	0.31	10.87	16.67	13.75	11.63	12.59	0.62
4-25-72	1.91	0.45	9.00	0.29	8.82	16.36	-	-	-	0.59
5-9-72	2.27	0.54	12.50	0.37	11.47	25.00	17.19	12.25	13.59	0.77
5-23-72	2.18	0.36	9.38	0.34	11.19	33.89	-	-	-	0.68
6-6-72	2.24	0.42	7.22	0.38	12.38	30.95	17.10	13.68	14.32	0.89
6-20-72	2.83	0.39	10.62	0.38	11.59	30.36	-	-	-	0.73
7-11-72	2.00	0.50	9.85	0.37	12.62	26.00	16.25	14.77	-	0.61
7-25-72	1.90	0.61	10.59	0.41	14.02	22.87	18.07	15.89	-	0.81
8-8-72	1.88	0.60	10.07	0.51	13.43	28.43	18.59	14.36	-	0.77
8-23-72	2.53	0.71	10.86	0.44	14.21	28.41	-	-	-	0.74
9-7-72	1.65	0.60	9.42	0.39	12.04	26.26	17.57	14.64	21.67	0.69
9-20-72	1.75	0.62	9.79	0.39	11.20	25.69	-	-	-	0.69
10-11-72	-	0.54	9.99	0.38	12.08	24.65	18.67	14.58	-	0.72
10-24-72	3.44	0.62	11.23	0.44	12.92	30.51	19.38	15.35	-	0.91
11-8-72	2.04	0.39	7.52	0.30	9.09	17.86	13.16	10.99	-	0.59
11-21-72	1.96	0.36	6.25	0.26	5.92	14.29	12.33	11.25	-	0.52
11-30-72	2.55	0.44	8.86	0.35	7.69	20.69	17.39	13.64	25.70	0.69
12-19-72	2.31	0.37	6.95	0.36	6.23	-	16.70	11.50	-	0.65

TABLE 7

CELL D LEACHATE
ELECTRO-CONDUCTIVITY/PARAMETER RATIOS

DATE	PARAMETER									
	ALKALINITY	BOD	CALCIUM	COD	CHLORIDE	MAGNESIUM	POTASSIUM	SODIUM	SULPHATE	TDS
1-10-73	2.78	0.47	8.59	0.41	10.43	21.88	18.67	14.05	-	0.72
1-23-73	2.04	0.33	8.94	0.28	8.10	15.58	11.62	9.60	-	0.52
2-6-73	1.46	0.37	12.03	0.21	5.98	11.72	9.12	7.27	-	0.40
2-27-73	-	0.33	5.30	0.23	5.71	11.00	10.94	7.38	-	0.43
3-13-73	1.42	0.34	5.00	0.24	5.30	18.04	11.48	7.88	15.91	0.41
3-27-73	1.10	0.28	4.33	0.20	4.35	9.80	8.82	6.64	-	0.34
4-10-73	1.36	0.25	4.33	0.21	5.38	10.79	9.84	6.82	-	0.35
4-24-73	1.22	0.25	3.75	0.21	5.17	9.93	9.38	7.00	-	0.35
5-15-73	1.06	0.30	3.94	0.19	3.31	7.14	17.14	5.45	15.19	0.31
6-5-73	1.43	0.38	5.55	0.26	3.83	11.36	-	-	-	0.40
6-26-73	1.27	0.36	5.92	0.26	4.89	17.72	21.54	13.73	21.79	0.38
AVERAGE	2.03	0.44	7.92	0.32	9.16	20.46	14.80	11.30	16.44	0.61

TABLE 8

COMPANION THERMISTER COMPARISON

DATE	TEMPERATURE - ° C	
	Thermister Inside Top Gas Probe Cell B	Thermister Outside Top Gas Probe Cell B
12-2-71	22.2	22.2
12-3-71	21.0	21.1
12-6-71	20.9	20.8
12-7-71	21.7	21.7
12-8-71	21.7	21.8
12-9-71	22.7	22.7
12-10-71	22.6	22.6
12-14-71	25.6	25.6
12-15-71	21.3	21.2
12-16-71	21.3	21.1
12-17-71	21.2	21.0
12-20-71	20.9	20.9
12-28-71	20.0	20.1
12-29-71	19.8	20.1
1-27-72	17.2	16.7
2-15-72	15.9	15.6
3-14-72	16.9	16.8
3-28-72	17.5	17.4
4-11-72	17.5	17.4
4-25-72	17.6	17.5
5-9-72	18.8	18.7
5-23-72	20.0	20.0
6-6-72	21.1	21.1

TABLE 9

TRACE METAL CONCENTRATIONS IN LEACHATE
CELLS A, B & E

CELL A	ELEMENT - mg/l				
Date	Cu	Zn	Cd	Hg	Pb
2-15-72	ND	2.1	ND	0.0006	ND
9-7-72	ND	0.23	ND	0.0065	0.16
10-11-72	0.16	0.58	ND	0.0035	0.12
11-21-72	0.15	9.0	ND	0.013	0.44
4-10-73	0.22	3.0	ND	ND	1.81
CELL B					
1-3-72	3.6	140.0	ND	0.006	3.0
10-24-72	0.29	62.0	0.19	0.0035	0.95
3-13-73	0.18	10.8	ND	0.0044	0.33
CELL E					
2-15-72	ND	ND	-	0.0005	ND
10-24-72	0.12	1.67	0.09	0.0145	0.60
1-23-73	0.10	41.0	ND	0.0112	0.60
3-13-73	0.19	5.6	ND	0.0044	0.45
4-24-73	0.32	64.0	0.05	ND	0.21
6-5-73	0.10	58.0	0.05	-	0.42

ND - Not detected
- No analysis made

TABLE 10

TRACE METAL CONCENTRATIONS IN LEACHATE
CELL C

DATE	ELEMENT - mg/l				
	Cu	Zn	Cd	Hg	Pb
3-2-72	0.6	42.0	ND	0.0014	ND
4-11-72	ND	30.0	ND	0.0016	ND
5-9-72	ND	30.0	ND	0.015	ND
6-6-72	0.15	22.0	0.1	0.0102	0.8
7-11-72	0.15	13.0	ND	0.0065	ND
7-25-72	0.18	10.0	ND	-	0.1
8-8-72	0.13	9.5	ND	0.018	0.2
9-7-72	0.07	7.5	ND	0.06	0.22
10-11-72	0.08	6.5	ND	0.0065	0.15
10-24-72	0.06	7.5	0.05	-	0.35
11-8-72	0.11	8.5	0.06	0.0035	0.15
11-21-72	0.1	8.0	0.04	-	0.17
2-6-73	0.06	4.6	ND	0.0166	ND
2-27-73	0.06	4.5	ND	0.0123	ND
3-13-73	0.05	4.3	ND	0.0007	0.1
3-27-73	0.06	2.8	ND	-	-
4-10-73	0.08	3.5	0.05	0.0034	0.1
4-24-73	0.05	3.8	0.05	0.0078	0.1
5-15-73	0.04	2.5	0.05	0.0018	ND
6-26-73	0.02	0.6	<0.05	0.0002	Tr.

ND - Not detected

- No analysis made

TABLE 11

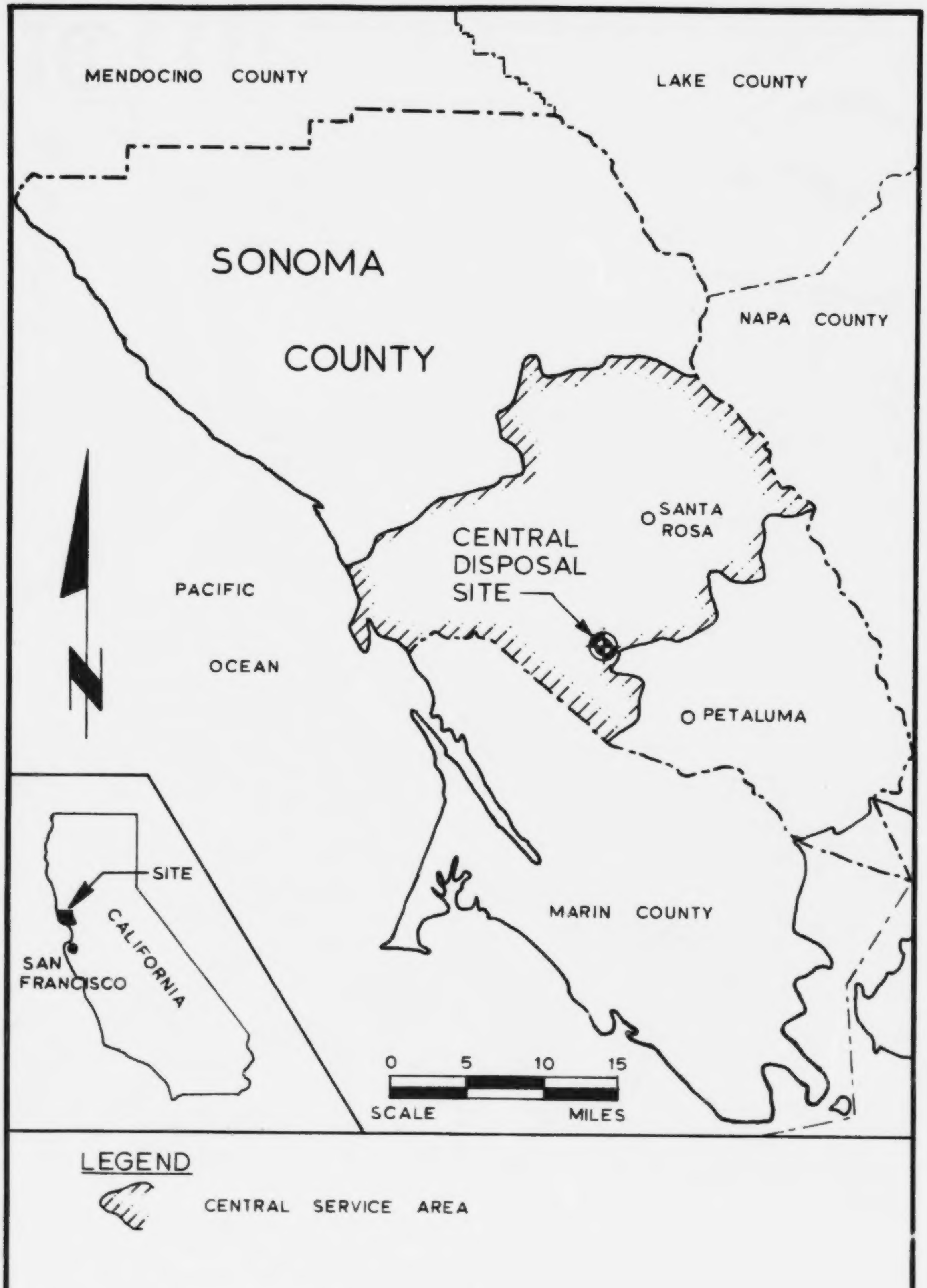
TRACE METAL CONCENTRATIONS IN LEACHATE

CELL D

DATE	ELEMENT - mg/l				
	Cu	Zn	Cd	Hg	Pb
1-18-72	0.4	95.0	0.1	0.003	2.0
3-2-72	ND	40.0	ND	0.0058	ND
4-11-72	ND	40.0	ND	0.0028	1.0
5-9-72	ND	30.0	ND	0.0066	ND
6-6-72	0.1	30.0	0.13	0.0052	0.5
7-11-72	0.15	28.0	ND	0.009	0.18
7-25-72	0.16	28.0	ND	-	0.35
8-8-72	0.14	-	ND	0.012	0.64
9-7-72	0.15	21.5	ND	0.064	0.36
10-11-72	0.25	29.5	ND	0.0055	0.59
10-24-72	0.1	28.5	0.16	-	0.47
11-8-72	0.35	27.5	0.09	0.0022	0.32
11-21-72	0.32	25.0	0.04	-	0.37
1-10-73	0.29	21.0	ND	0.0086	0.43
1-23-73	0.08	22.5	ND	0.0108	0.40
2-6-73	0.11	17.8	ND	0.016	0.23
2-27-73	0.12	17.6	ND	0.0123	0.46
3-13-73	0.09	16.9	ND	0.0047	0.24
3-27-73	0.12	17.5	ND	0.0016	-
4-10-73	0.08	14.0	0.05	0.0008	0.1
4-24-73	0.06	15.0	0.05	0.003	0.5
5-15-73	0.04	12.0	0.05	ND	ND
6-26-73	0.08	8.5	<0.05	0	0.31

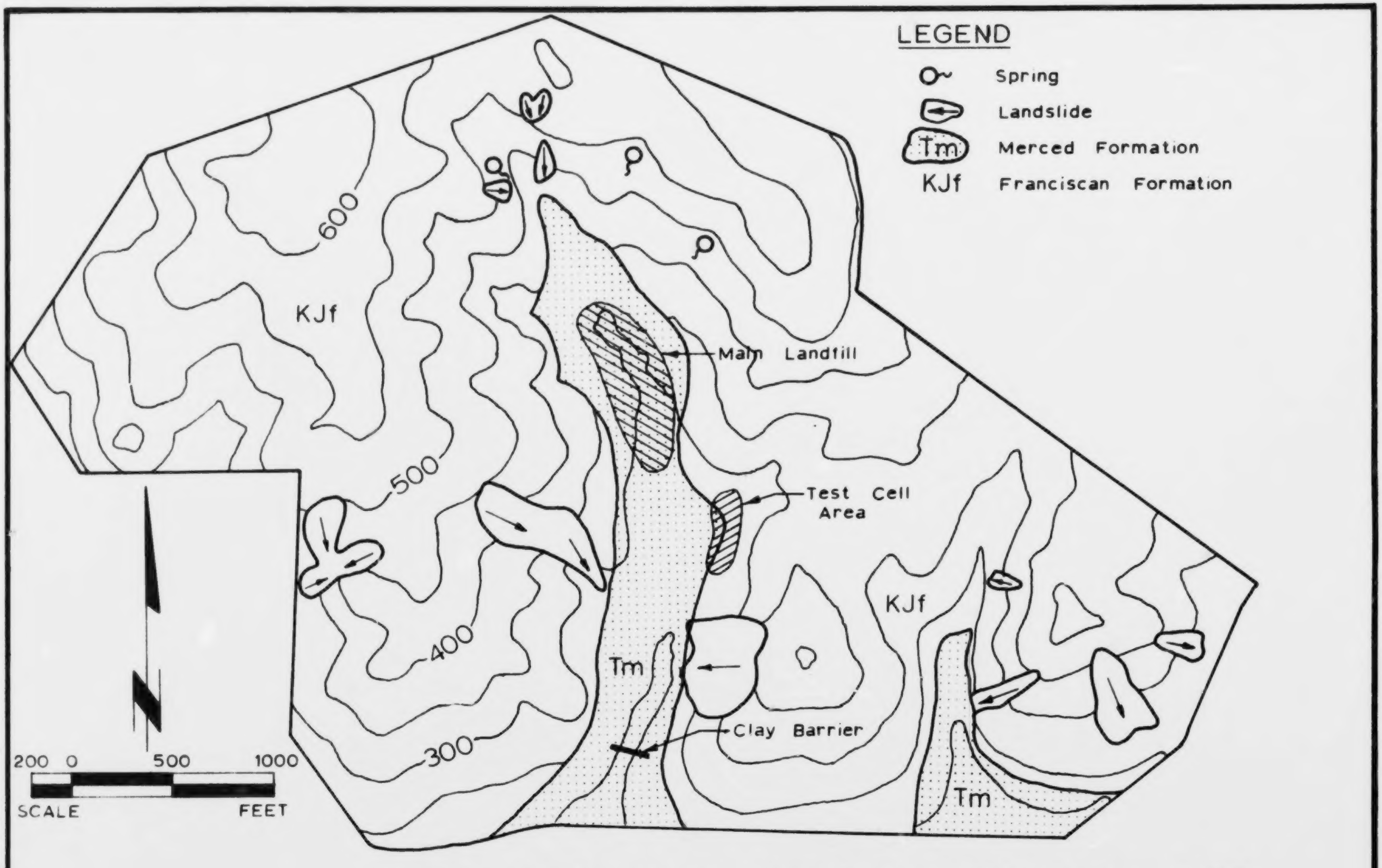
ND - Not detected

- No analysis made


MENDOCINO COUNTY
LAKE COUNTY
SONOMA COUNTY
NAPA COUNTY
SANTA ROSA
CENTRAL DISPOSAL SITE
PACIFIC OCEAN
PETALUMA
MARIN COUNTY
SITE
CALIFORNIA
SAN FRANCISCO
0 5 10 15
SCALE MILES
LEGEND
CENTRAL SERVICE AREA

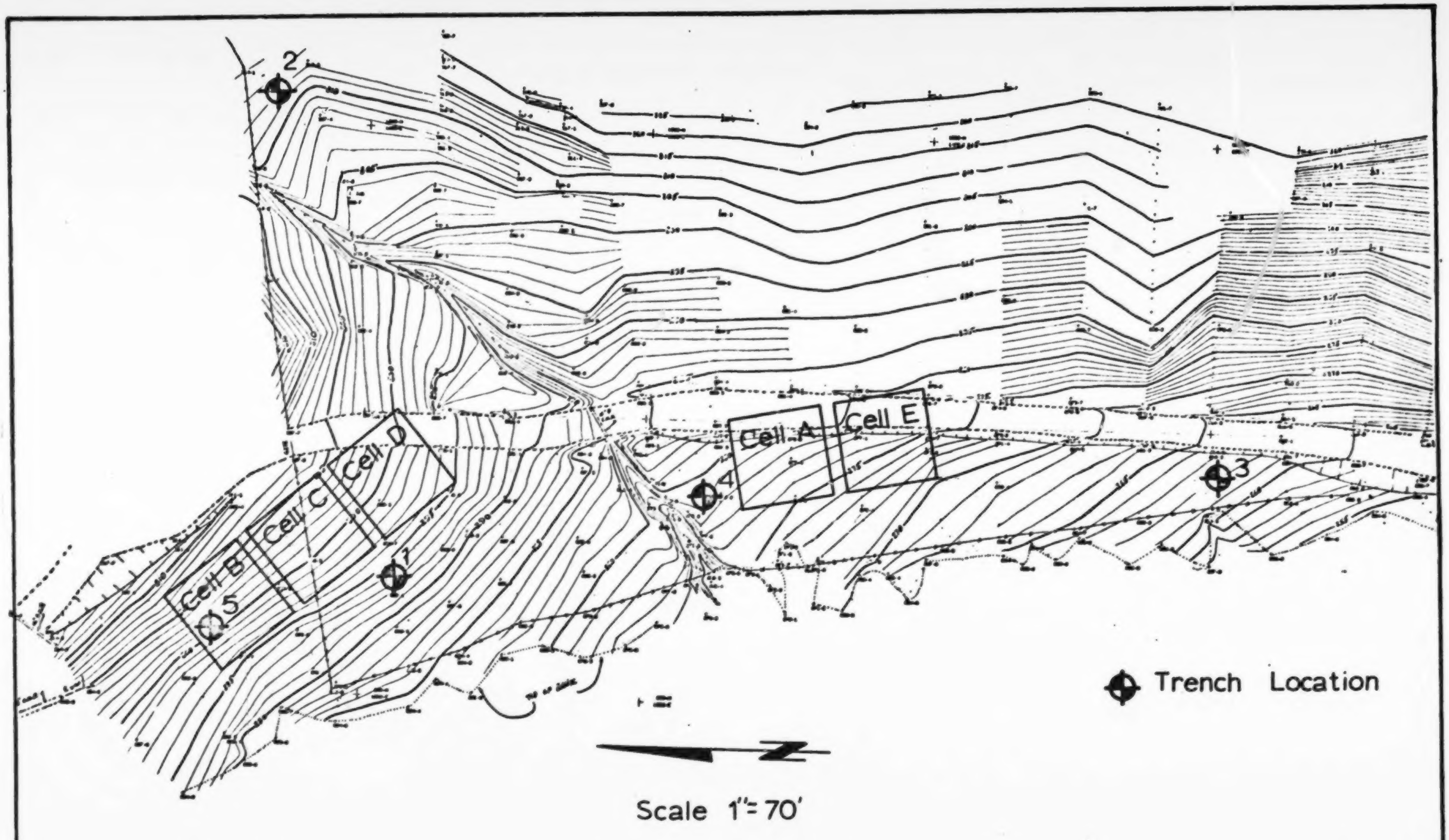
LOCATION MAP

FIGURE 1


LEGEND
Spring
Landslide
Tm Merced Formation
KJf Franciscan Formation
KJf
600
500
400
300
Main Landfill
Test Cell Area
KJf
Tm
Clay Barrier
Tm
200 0 500 1000
SCALE FEET

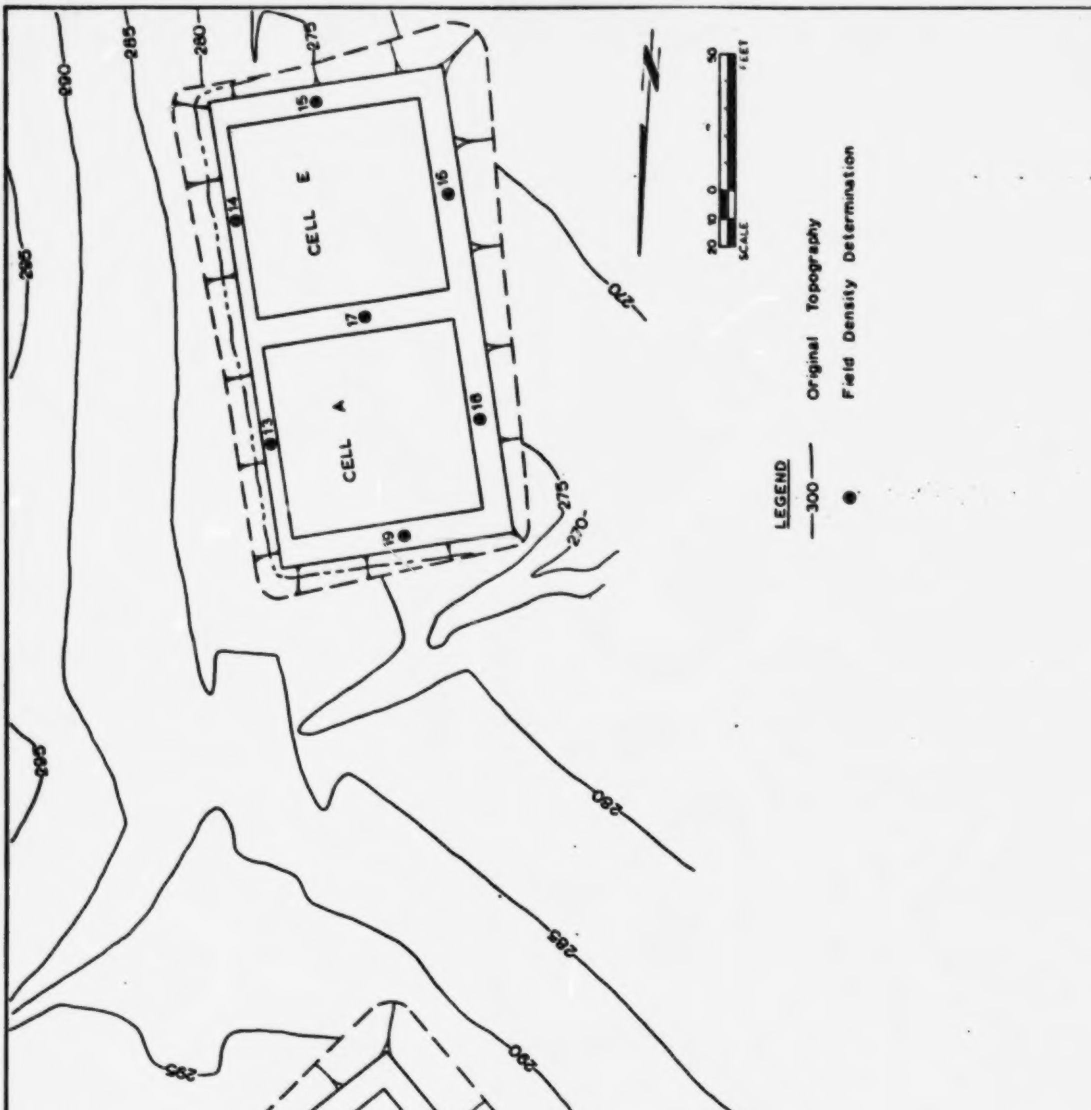
GEOLOGIC MAP, CENTRAL DISPOSAL SITE

FIGURE 2


2
Cell D
Cell C
Cell B
5
7
4
Cell A
Cell E
3
Trench Location
Scale 1"= 70'

EXPLORATION MAP

FIGURE 3


CELL A
CELL B
CELL C
CELL D
CELL E
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
270
275
280
285
290
295
300
305
310
315
LEGEND
—300— Original Topography
● Field Density Determination
20 10 0 50
SCALE
FEET

FIELD DENSITY TEST LOCATION MAP

FIGURE 4

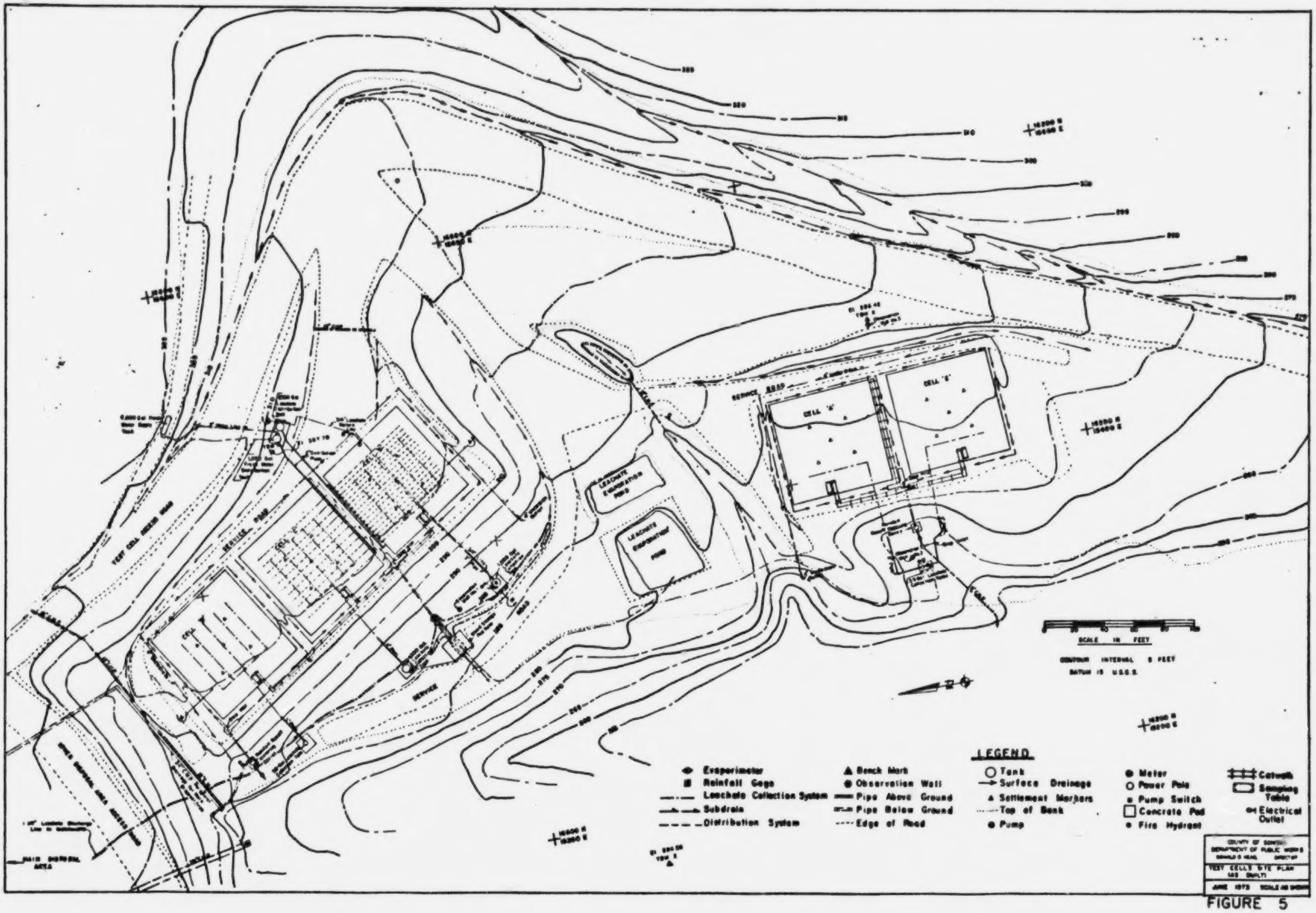

LEGEND
Evaporimeter
Rainfall Gage
Leachate Collection System
Subdrain
Distribution System
Bench Mark
Observation Well
Pipe Above Ground
Pipe Below Ground
Edge of Road
Tank
Surface Drainage
Settlement Markers
Top of Bank
Pump
Meter
Power Pole
Pump Switch
Concrete Pad
Fire Hydrant
Catwalk
Sampling Table
Electrical Outlet
SCALE IN FEET
CONTOUR INTERVAL 5 FEET
DATUM IS U.S.G.S.
CELL 'A'
CELL 'B'
LEACHATE EVAPORATION POND
SERVICE ROAD
TEST CELL ACCESS ROAD
COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
DIRECTOR
TEST CELLS SITE PLAN
(AS BUILT)
JUNE 1973
SCALE AS SHOWN

FIGURE 5

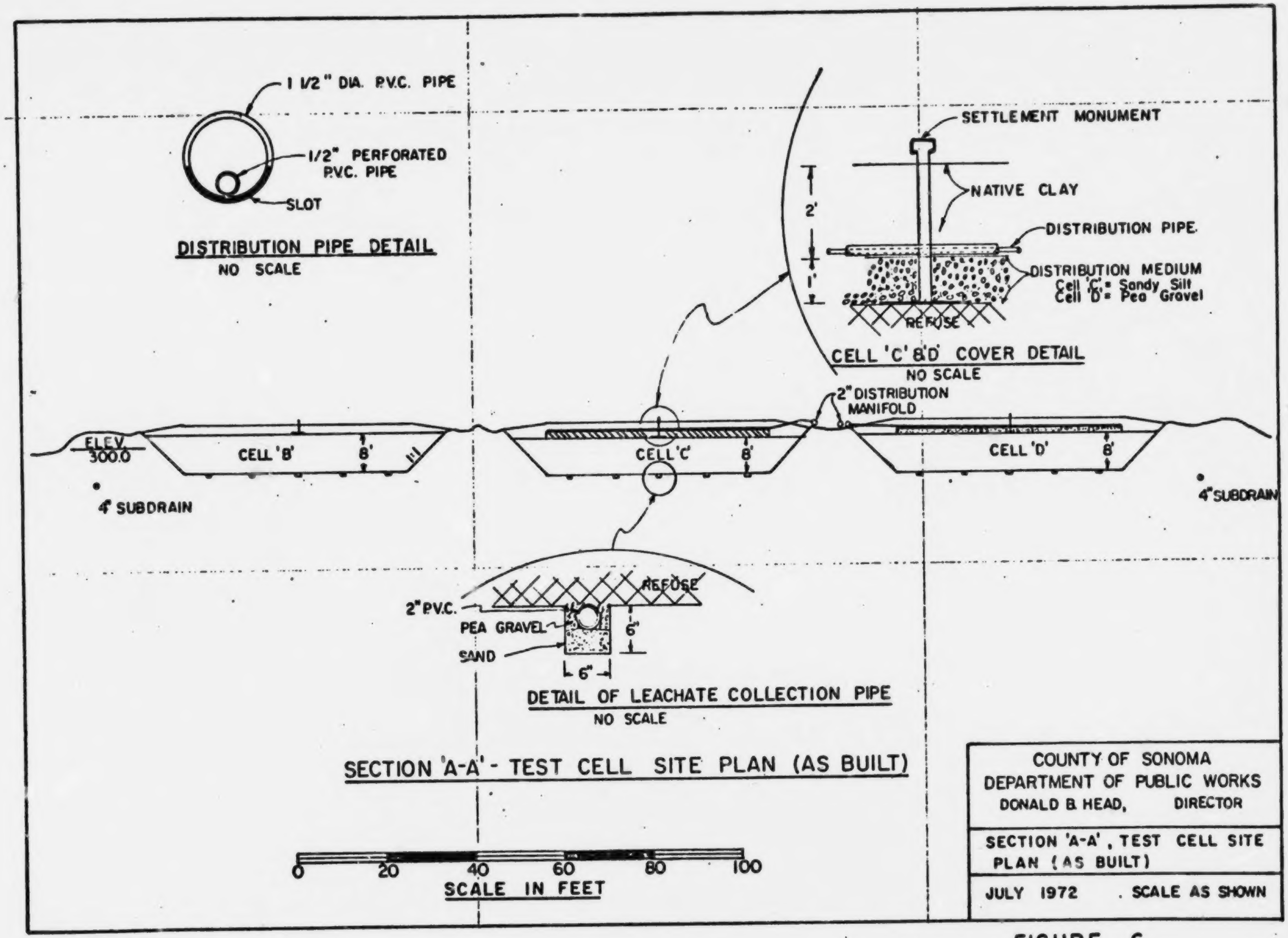
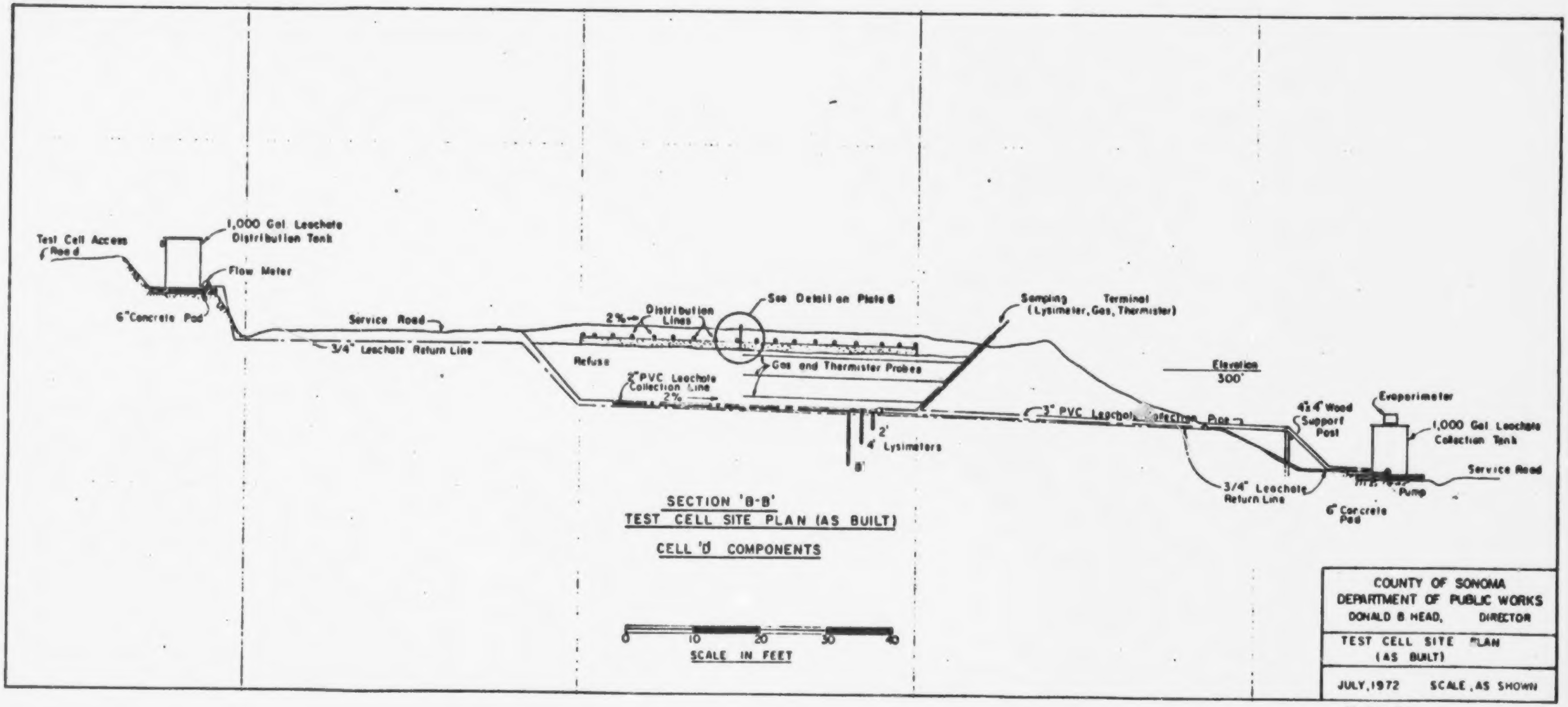

1 1/2" DIA. P.V.C. PIPE
1/2" PERFORATED P.V.C. PIPE
SLOT
DISTRIBUTION PIPE DETAIL
NO SCALE
SETTLEMENT MONUMENT
NATIVE CLAY
DISTRIBUTION PIPE
DISTRIBUTION MEDIUM
Cell 'C' = Sandy Silt
Cell 'D' = Pea Gravel
2'
1'
REFUSE
CELL 'C' & 'D' COVER DETAIL
NO SCALE
2" DISTRIBUTION MANIFOLD
ELEV. 300.0
CELL 'B'
8'
1:1
CELL 'C'
8'
CELL 'D'
8'
4" SUBDRAIN
4" SUBDRAIN
REFUSE
2" P.V.C.
PEA GRAVEL
SAND
6"
6"
DETAIL OF LEACHATE COLLECTION PIPE
NO SCALE
SECTION 'A-A' - TEST CELL SITE PLAN (AS BUILT)
0
20
40
60
80
100
SCALE IN FEET
COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
DONALD B. HEAD, DIRECTOR
SECTION 'A-A', TEST CELL SITE PLAN (AS BUILT)
JULY 1972 . SCALE AS SHOWN

FIGURE 6


Test Cell Access Road
1,000 Gal Leachate Distribution Tank
Flow Meter
6" Concrete Pad
Service Road
3/4" Leachate Return Line
2%
Distribution Lines
See Detail on Plate 6
Refuse
Gas and Thermister Probes
2" PVC Leachate Collection Line
2%
2'
4' Lysimeters
8'
Sampling Terminal (Lysimeter, Gas, Thermister)
3" PVC Leachate Collection Pipe
Elevation 300'
4"x 4" Wood Support Post
Evaporimeter
1,000 Gal Leachate Collection Tank
Service Road
Pump
3/4" Leachate Return Line
6" Concrete Pad
0
10
20
30
40
SCALE IN FEET

SECTION 'B-B'
TEST CELL SITE PLAN (AS BUILT)

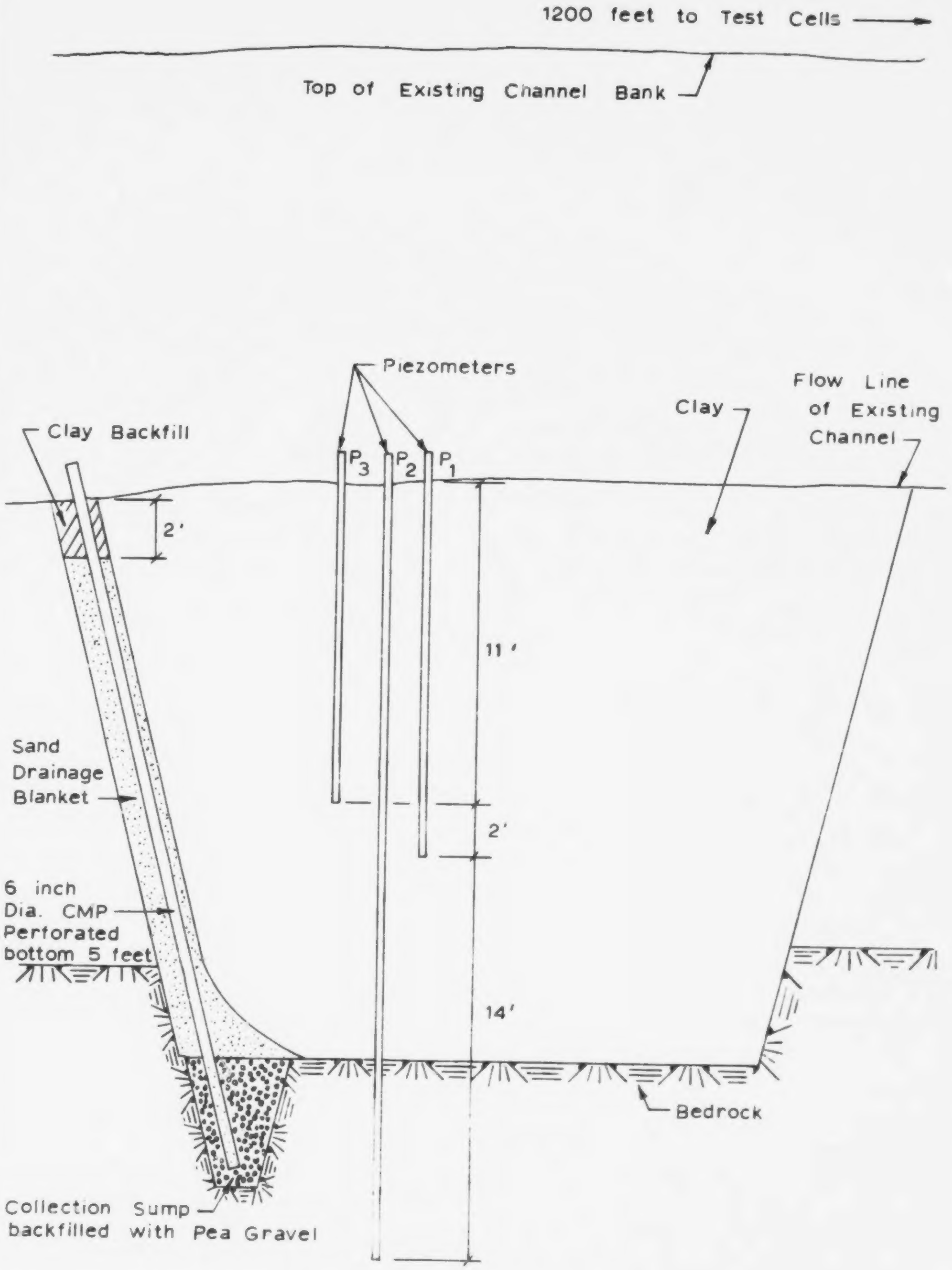
CELL 'D' COMPONENTS

COUNTY OF SONOMA
DEPARTMENT OF PUBLIC WORKS
DONALD B HEAD, DIRECTOR

TEST CELL SITE PLAN
(AS BUILT)

JULY, 1972 SCALE, AS SHOWN

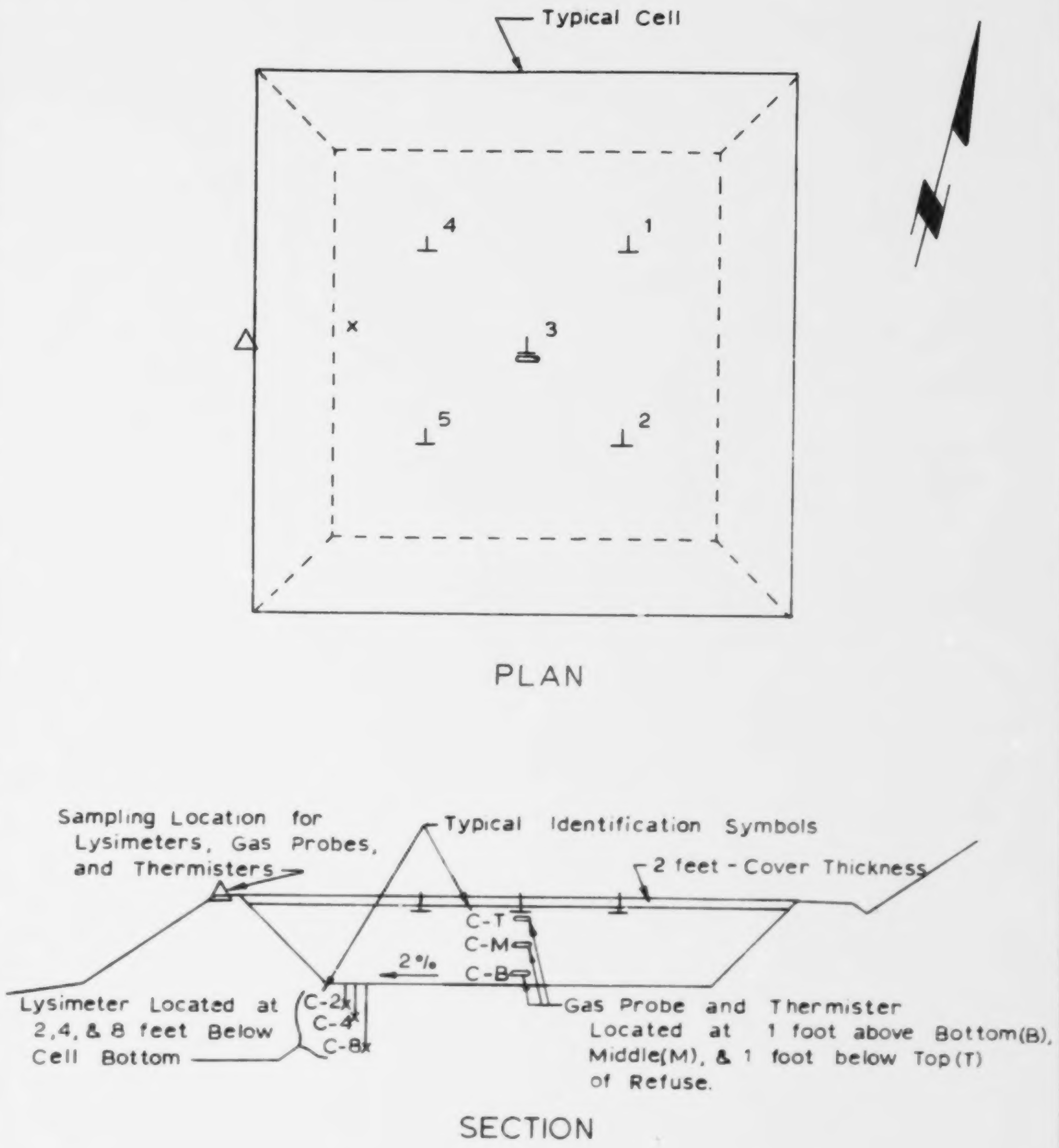
FIGURE 7


1200 feet to Test Cells
Top of Existing Channel Bank
Piezometers
Flow Line of Existing Channel
Clay
Clay Backfill
P3
P2
P1
2'
11'
2'
14'
Sand Drainage Blanket
6 inch Dia. CMP Perforated bottom 5 feet
Bedrock
Collection Sump backfilled with Pea Gravel

CLAY BARRIER CROSS SECTION

Scale: 1inch = 5 feet

FIGURE 8



Typical Cell
4
1
3
5
2
PLAN
Sampling Location for Lysimeters, Gas Probes, and Thermisters
Typical Identification Symbols
2 feet - Cover Thickness
C-T
C-M
C-B
2%
Lysimeter Located at 2,4, & 8 feet Below Cell Bottom
C-2
C-4
C-8
Gas Probe and Thermister Located at 1 foot above Bottom(B), Middle(M), & 1 foot below Top(T) of Refuse.
SECTION

LEGEND

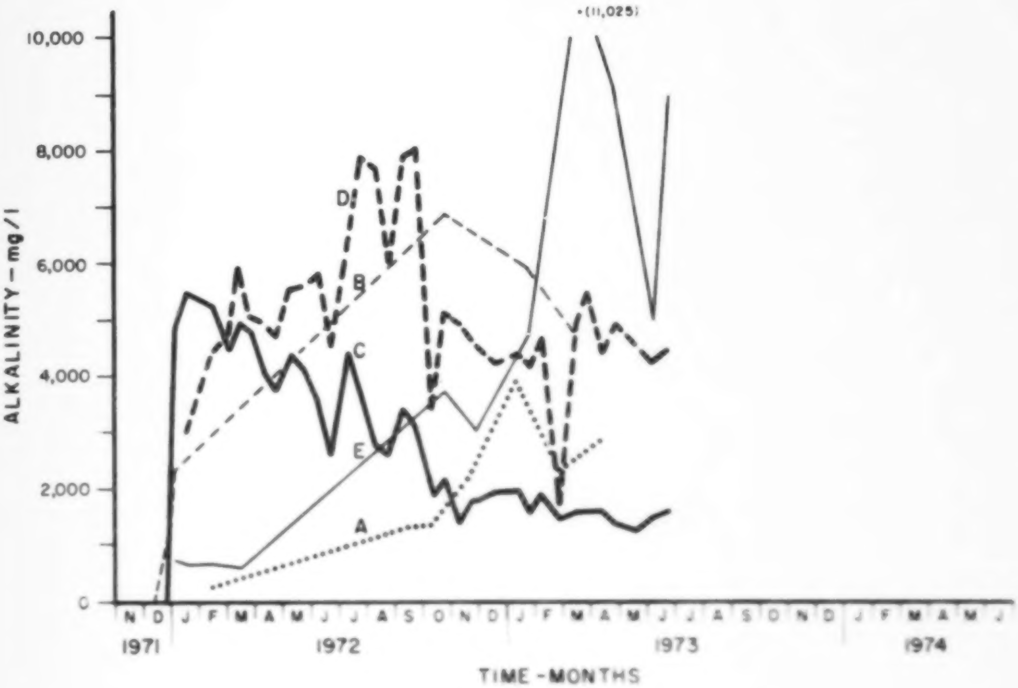
C-T	Cell 'C', Top Probe	⊥	Settlement Plate
C-4	Cell 'C', Lysimeter 4 feet below Cell Bottom	▭	Gas Probe & Thermister
		x	Lysimeter
		△	Sampling Location

TYPICAL INSTRUMENTATION LOCATION

SCALE: 1 inch = 20 feet

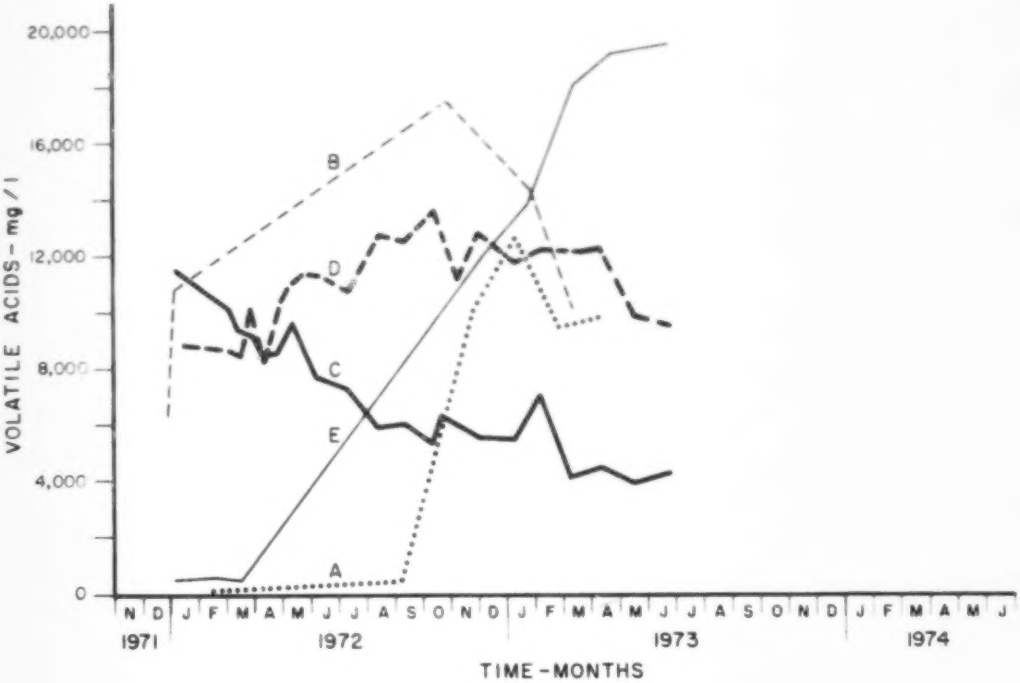
TI 1(8-71)

FIGURE 9



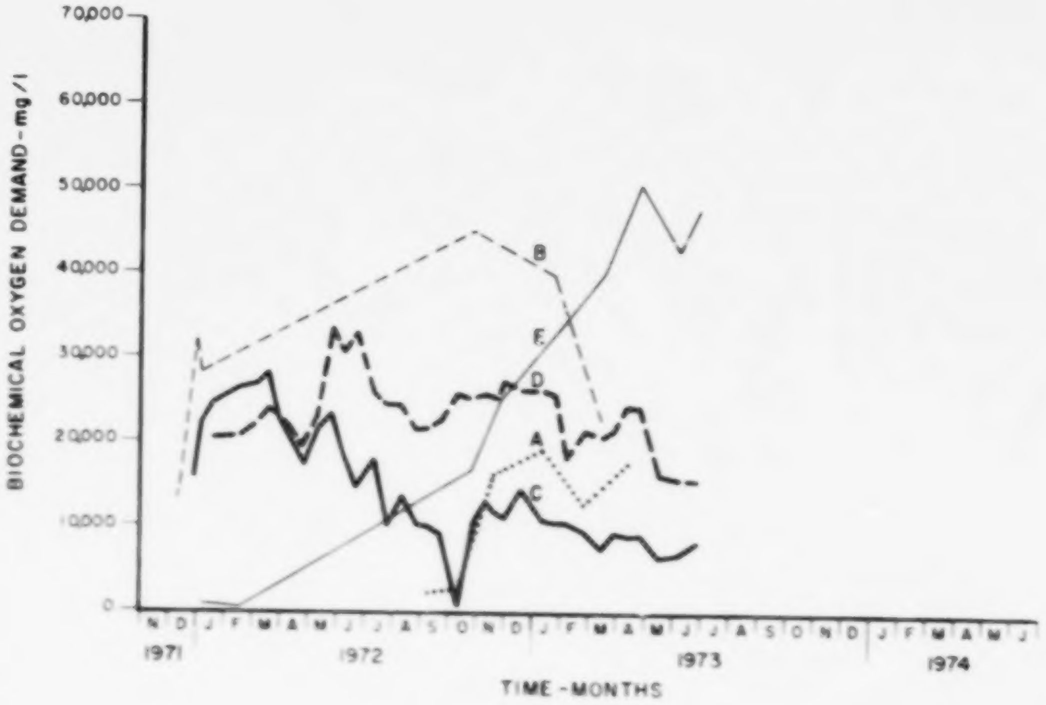
ALKALINITY OF LEACHATE

FIGURE 10

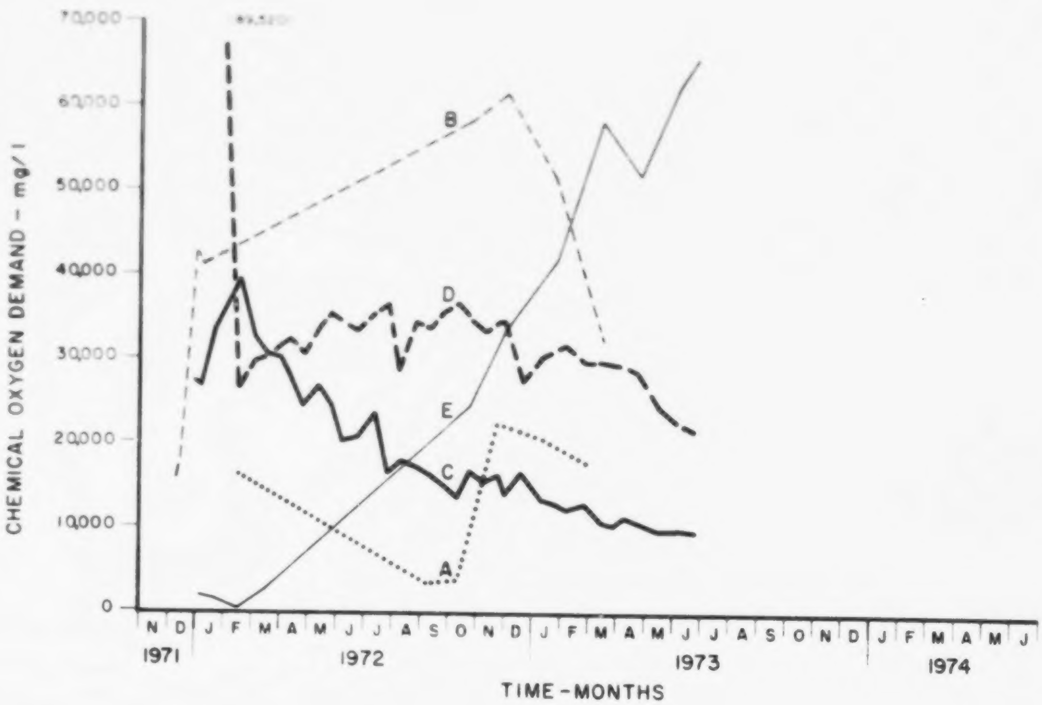


VOLATILE ACID CONCENTRATION OF LEACHATE

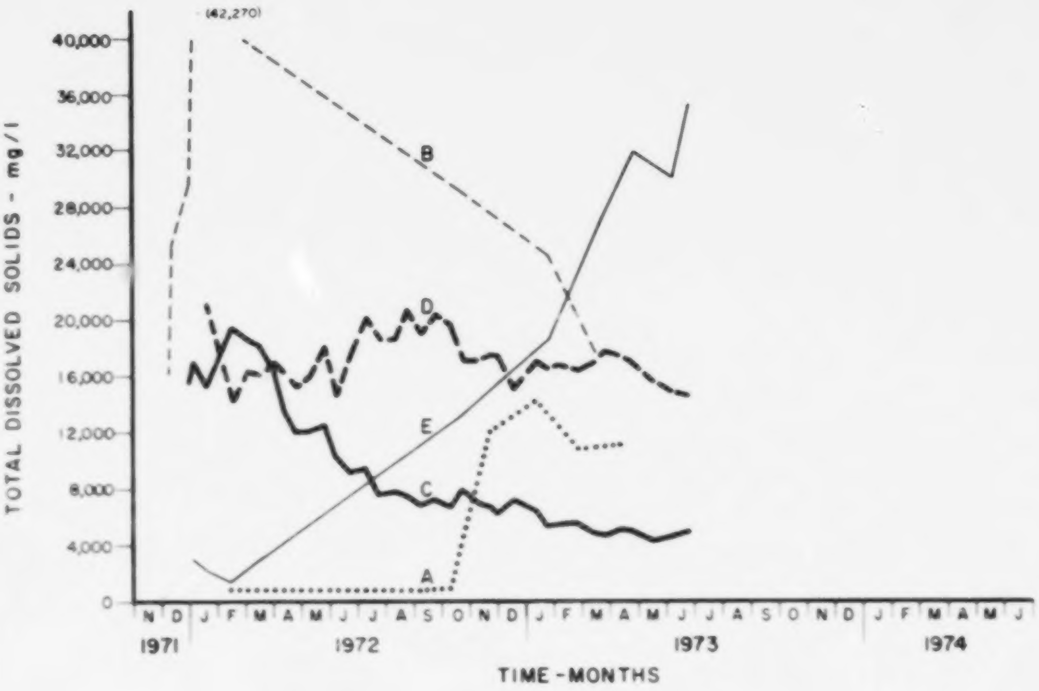
FIGURE 11



BIOCHEMICAL OXYGEN DEMAND OF LEACHATE FIGURE 12

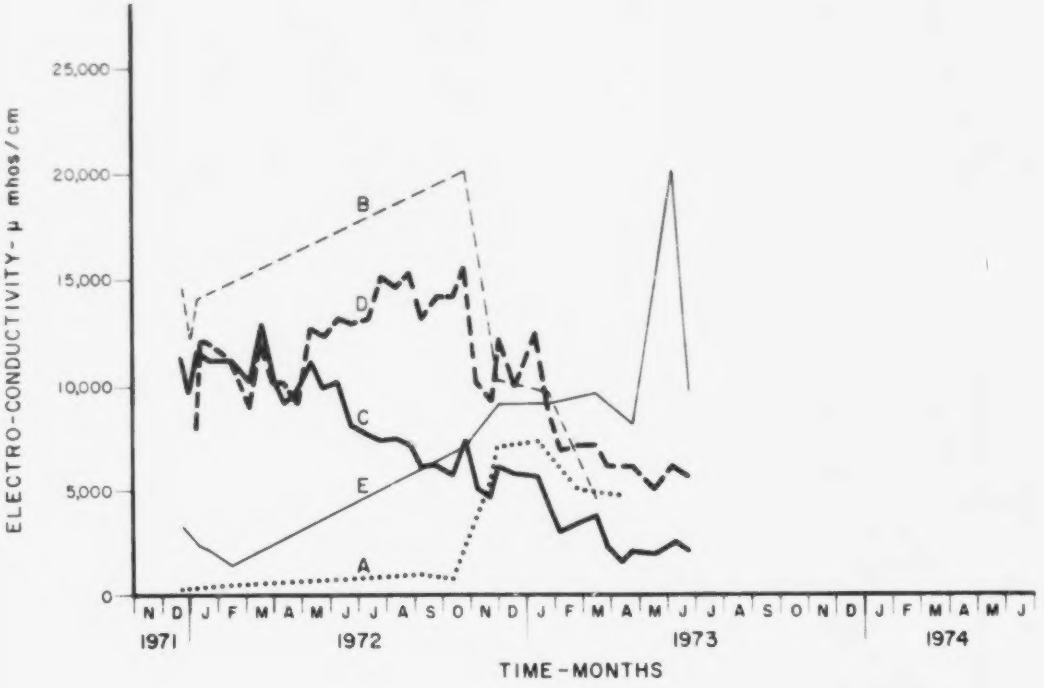


CHEMICAL OXYGEN DEMAND OF LEACHATE FIGURE 13



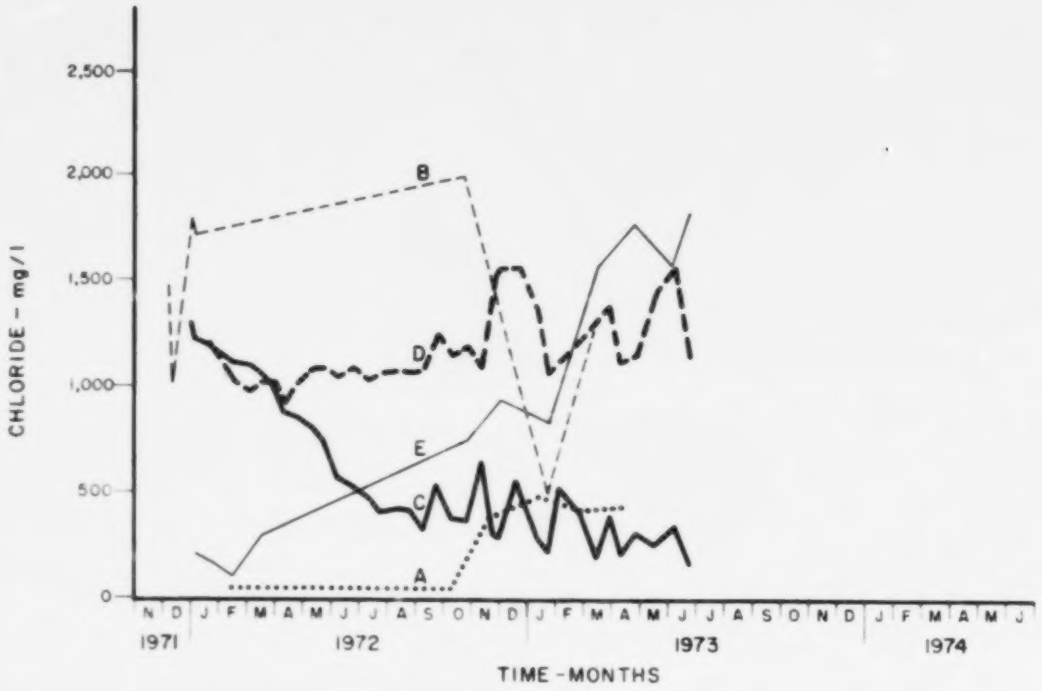
TOTAL DISSOLVED SOLIDS IN LEACHATE

FIGURE 14



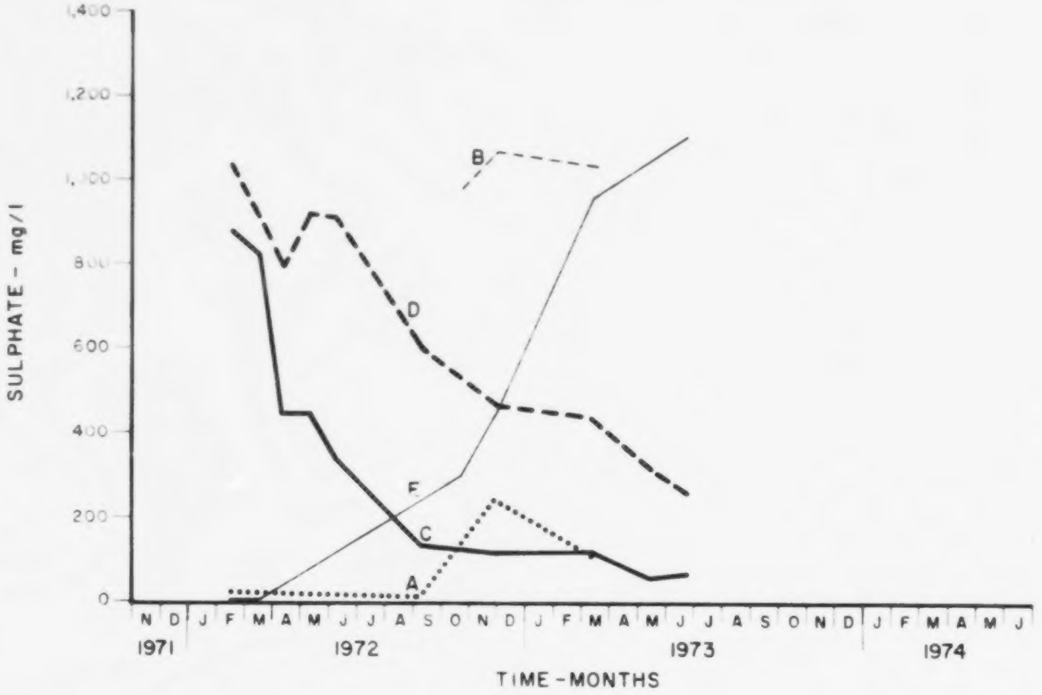
ELECTRO-CONDUCTIVITY OF LEACHATE

FIGURE 15



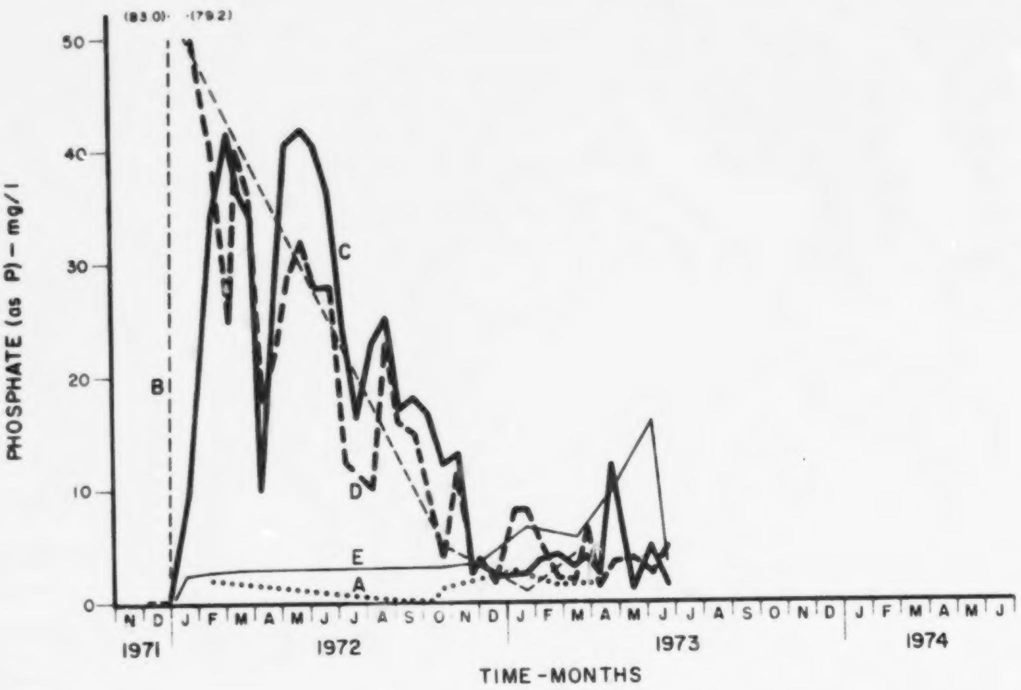
CHLORIDE CONCENTRATION OF LEACHATE

FIGURE 16



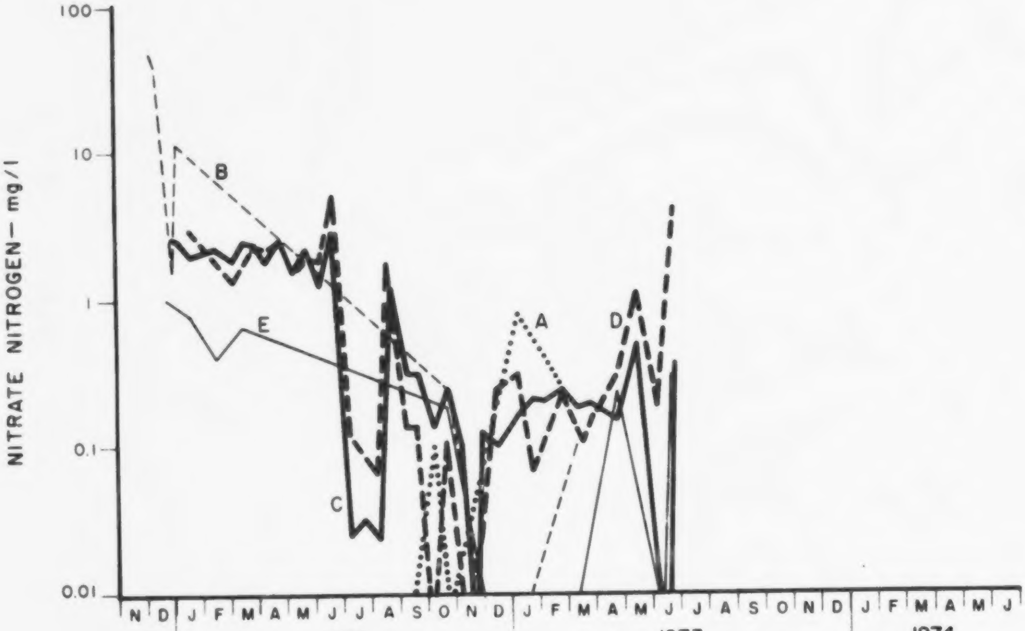
SULPHATE CONCENTRATION OF LEACHATE

FIGURE 17



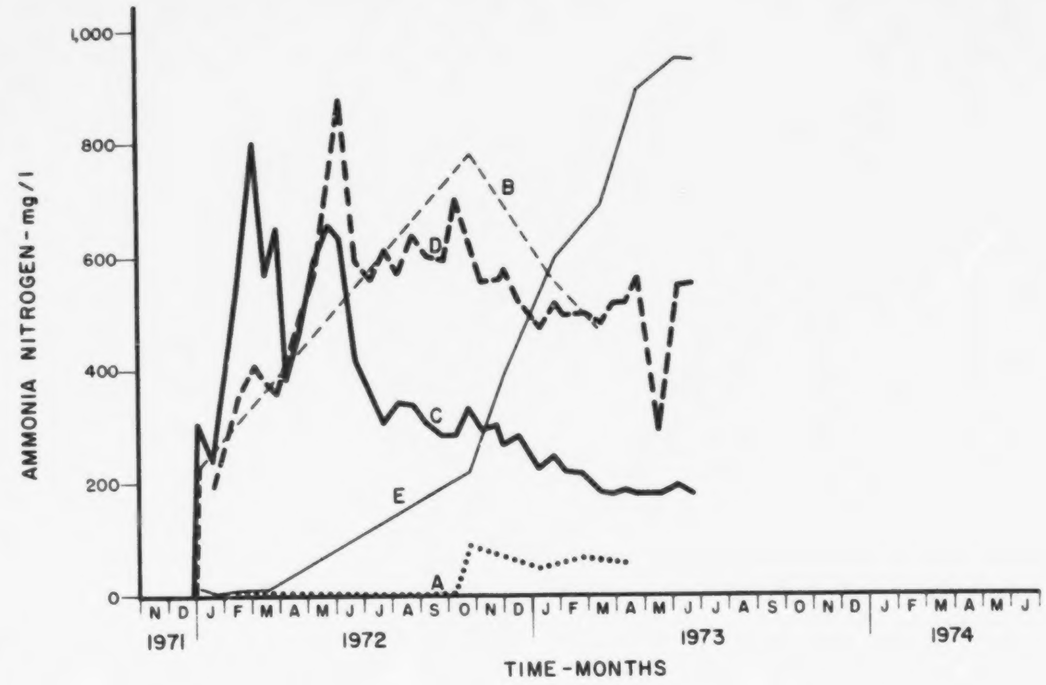
PHOSPHATE CONCENTRATION OF LEACHATE

FIGURE 18



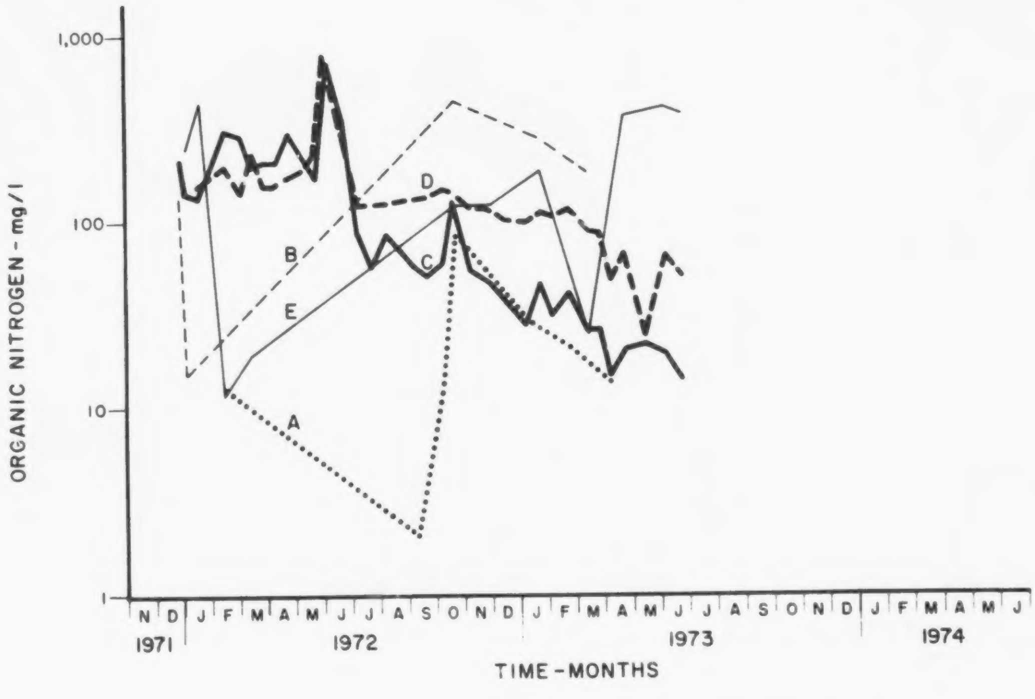
NITRATE-N CONCENTRATION OF LEACHATE

FIGURE 19



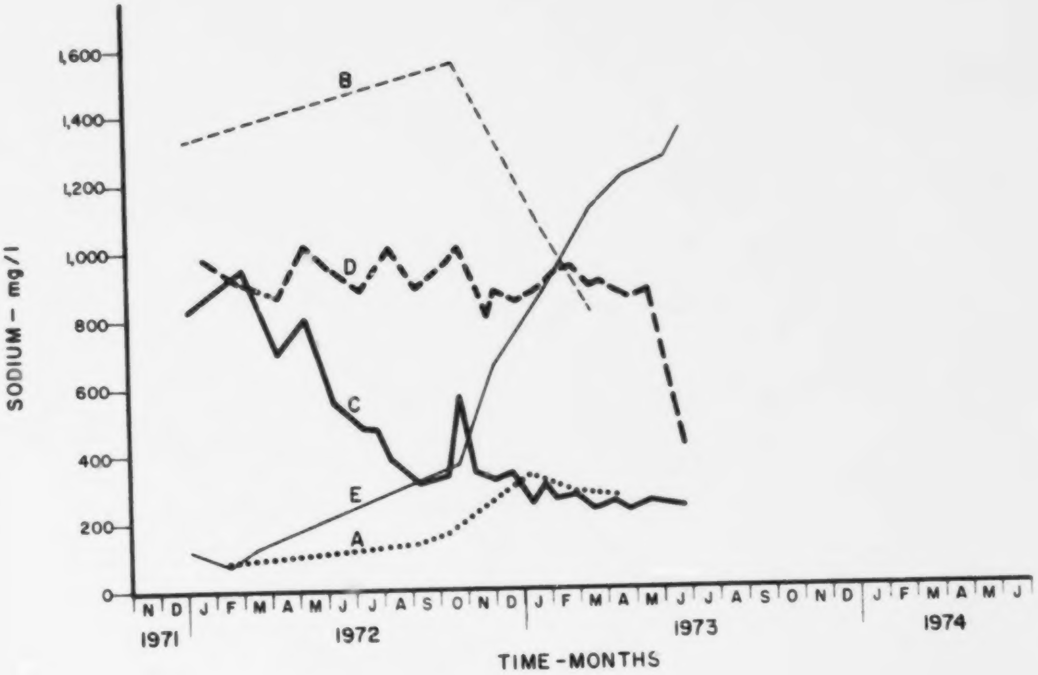
AMMONIA-N CONCENTRATION IN LEACHATE

FIGURE 20



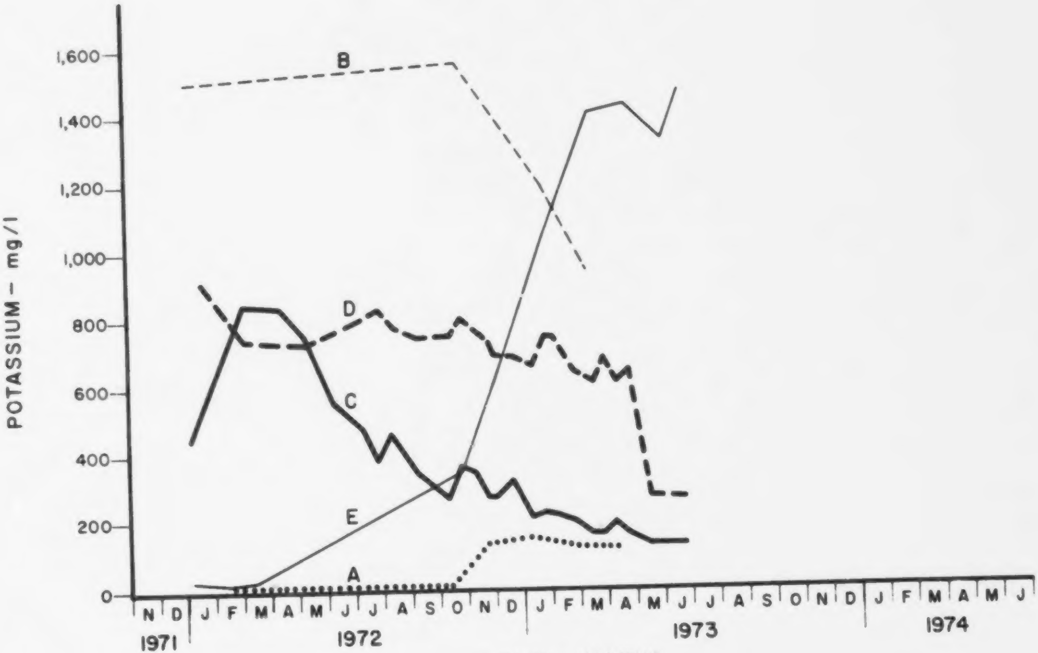
ORGANIC-N CONCENTRATION OF LEACHATE

FIGURE 21



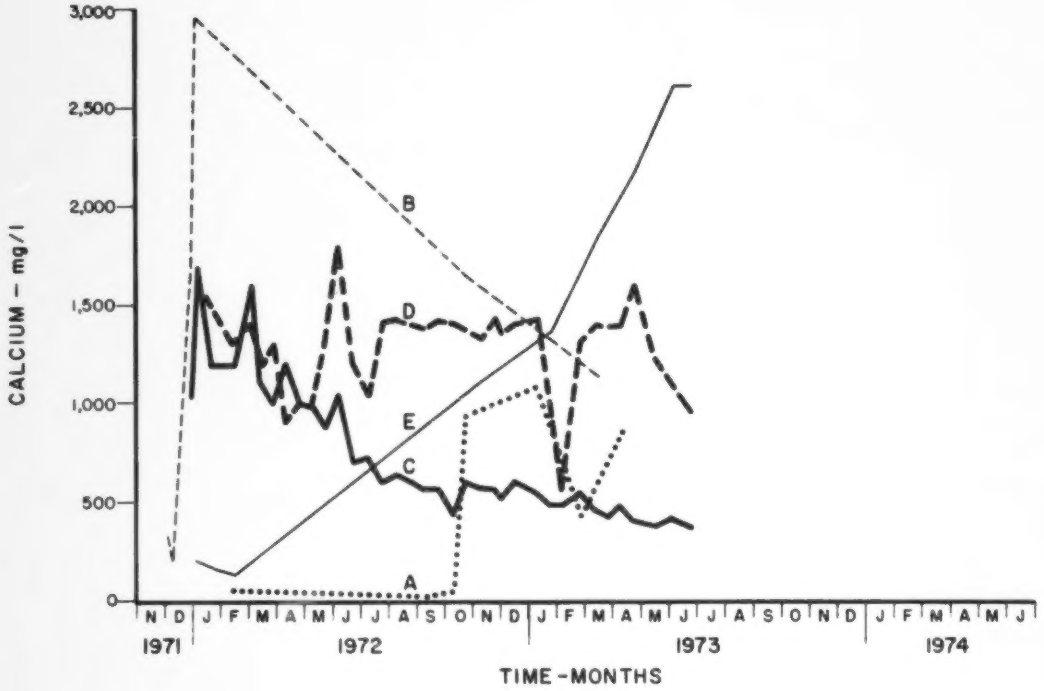
SODIUM CONCENTRATION OF LEACHATE

FIGURE 22



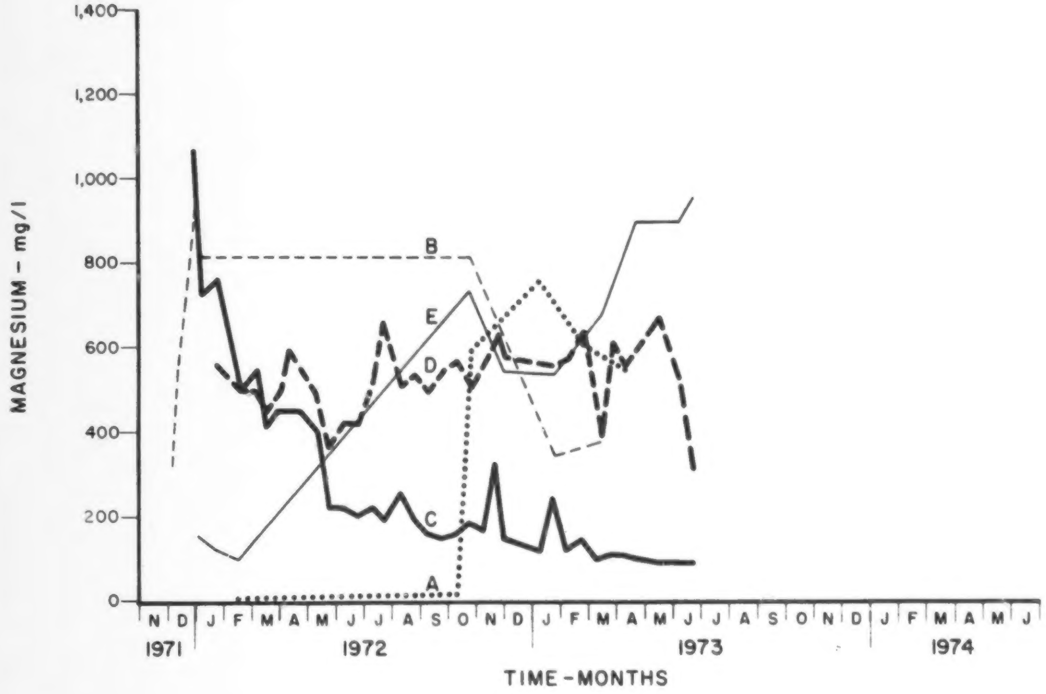
POTASSIUM CONCENTRATION OF LEACHATE

FIGURE 23



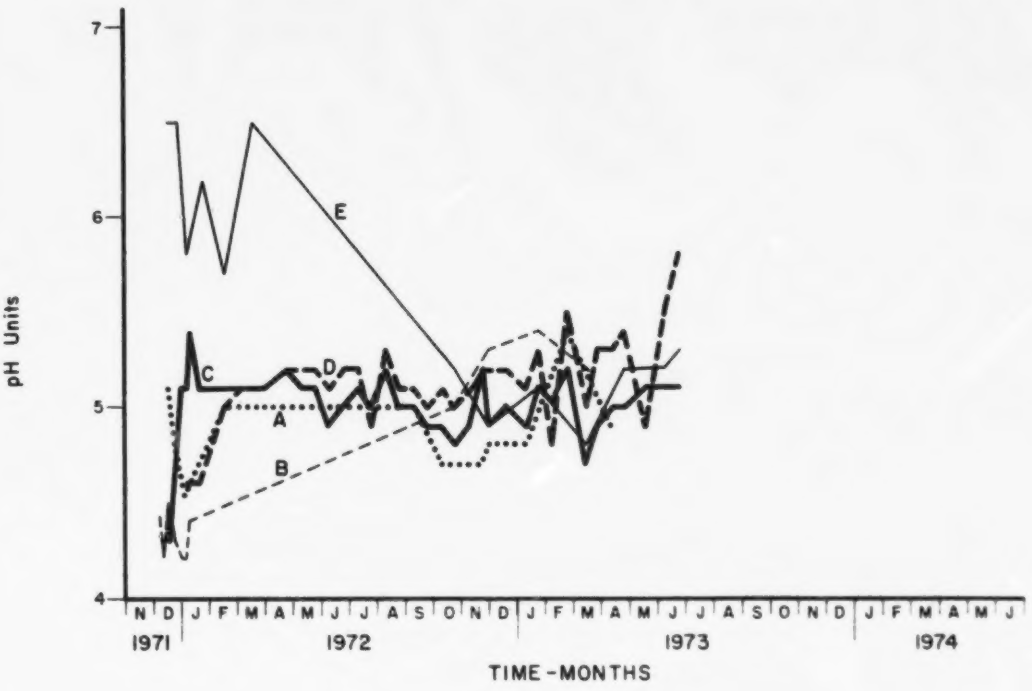
CALCIUM CONCENTRATION OF LEACHATE

FIGURE 24



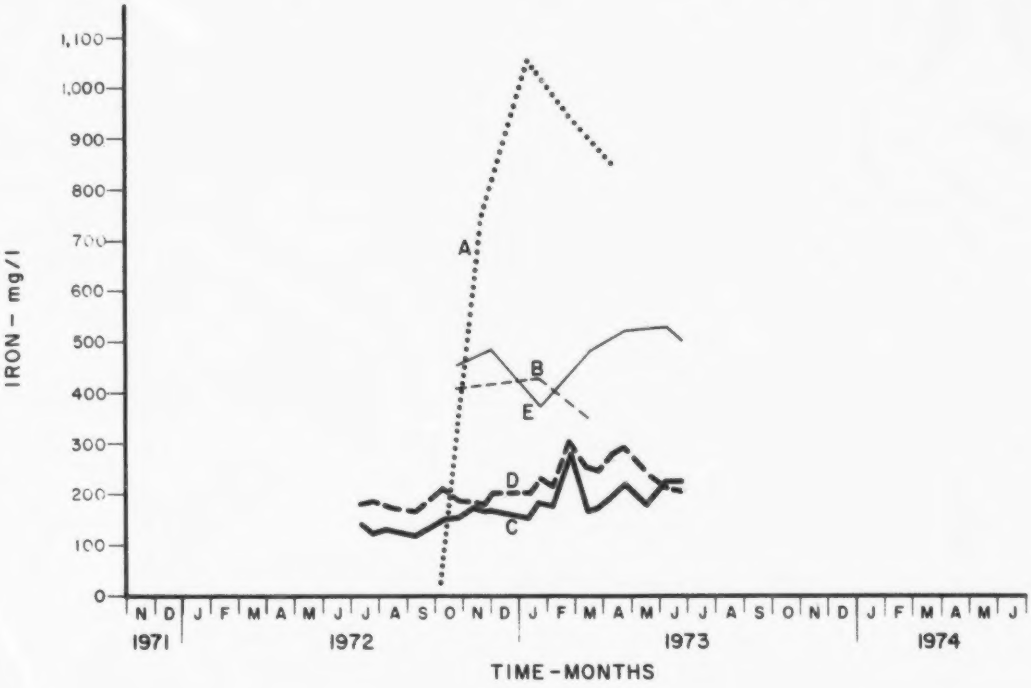
MAGNESIUM CONCENTRATION OF LEACHATE

FIGURE 25



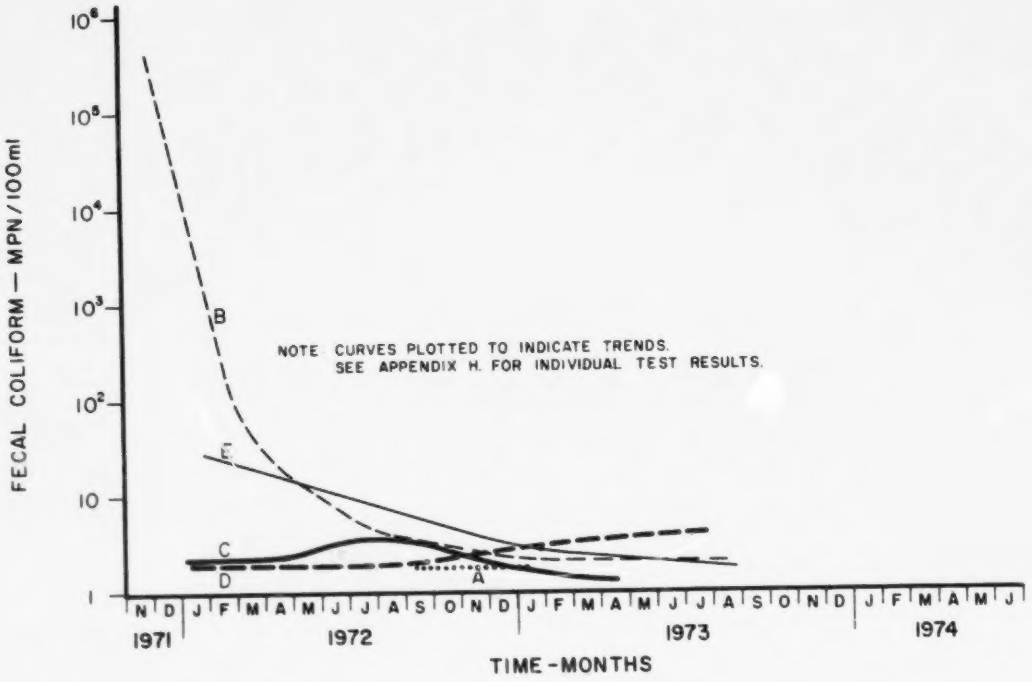
pH OF LEACHATE

FIGURE 26



IRON CONCENTRATION OF LEACHATE

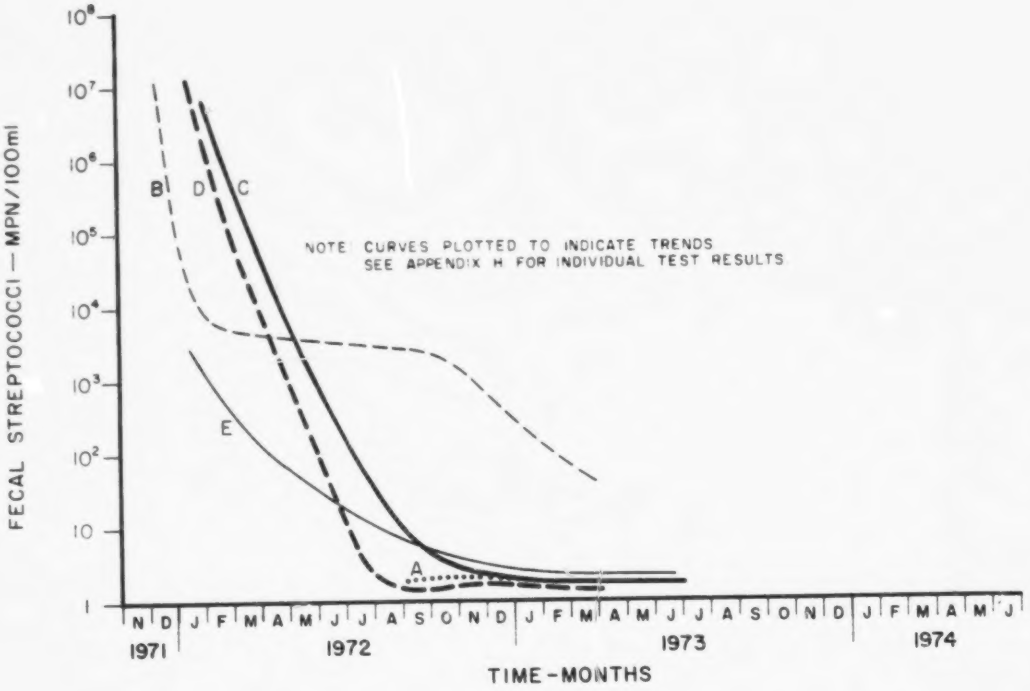
FIGURE 27



NOTE: CURVES PLOTTED TO INDICATE TRENDS.
SEE APPENDIX H. FOR INDIVIDUAL TEST RESULTS.

FECAL COLIFORM COUNT IN LEACHATE

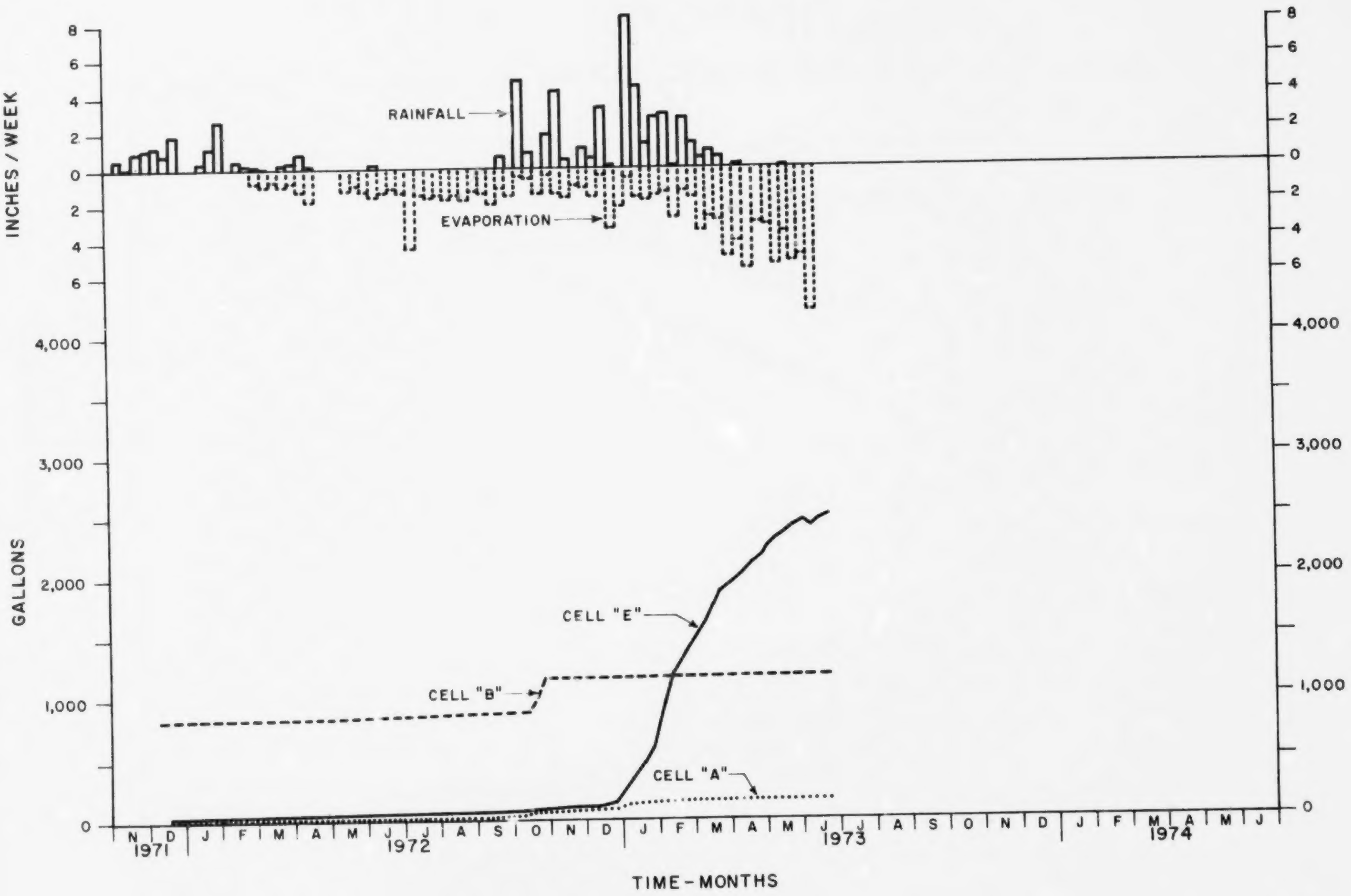
FIGURE 28



NOTE: CURVES PLOTTED TO INDICATE TRENDS.
SEE APPENDIX H. FOR INDIVIDUAL TEST RESULTS.

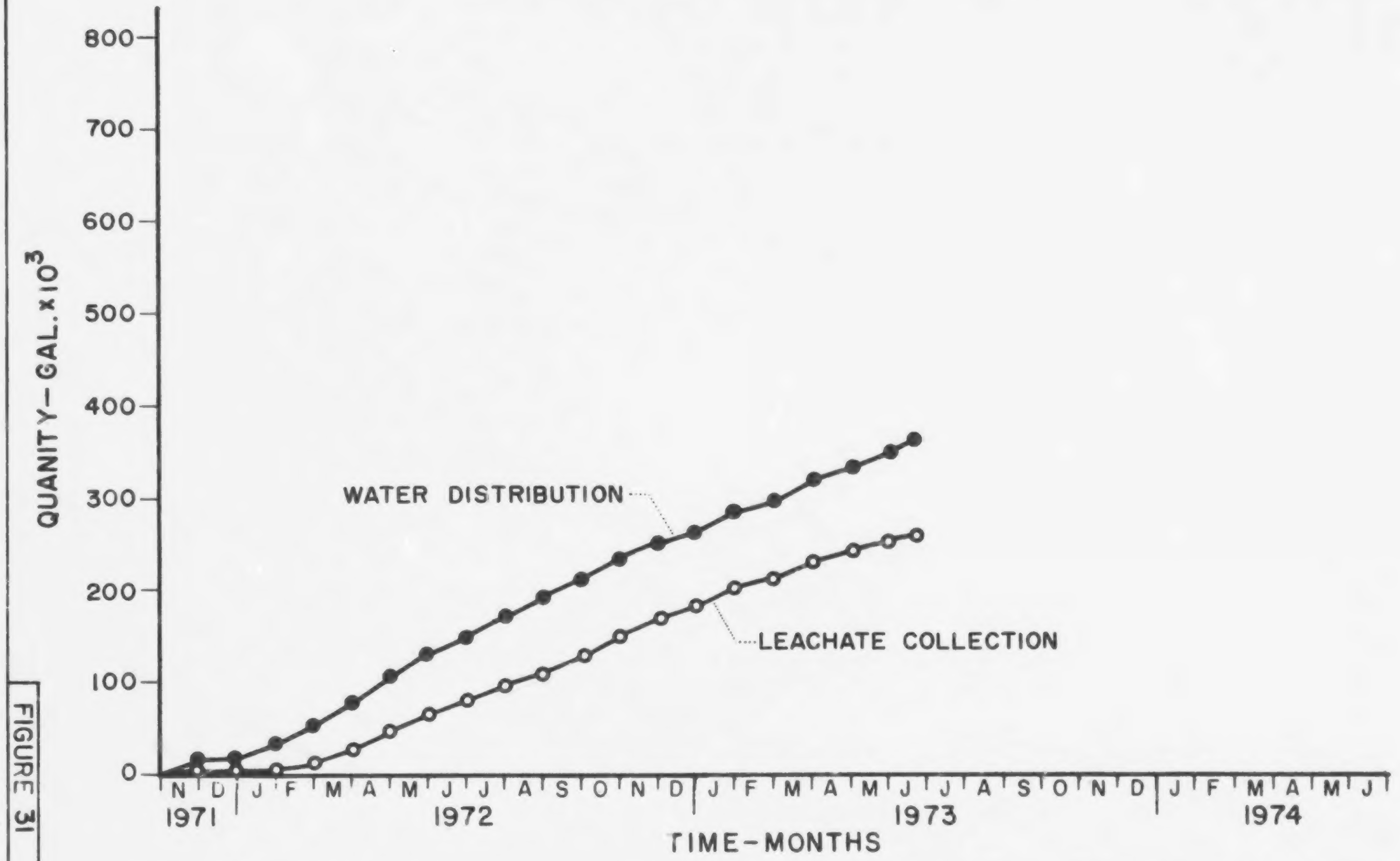
FECAL STREPTOCOCCI COUNT IN LEACHATE

FIGURE 29



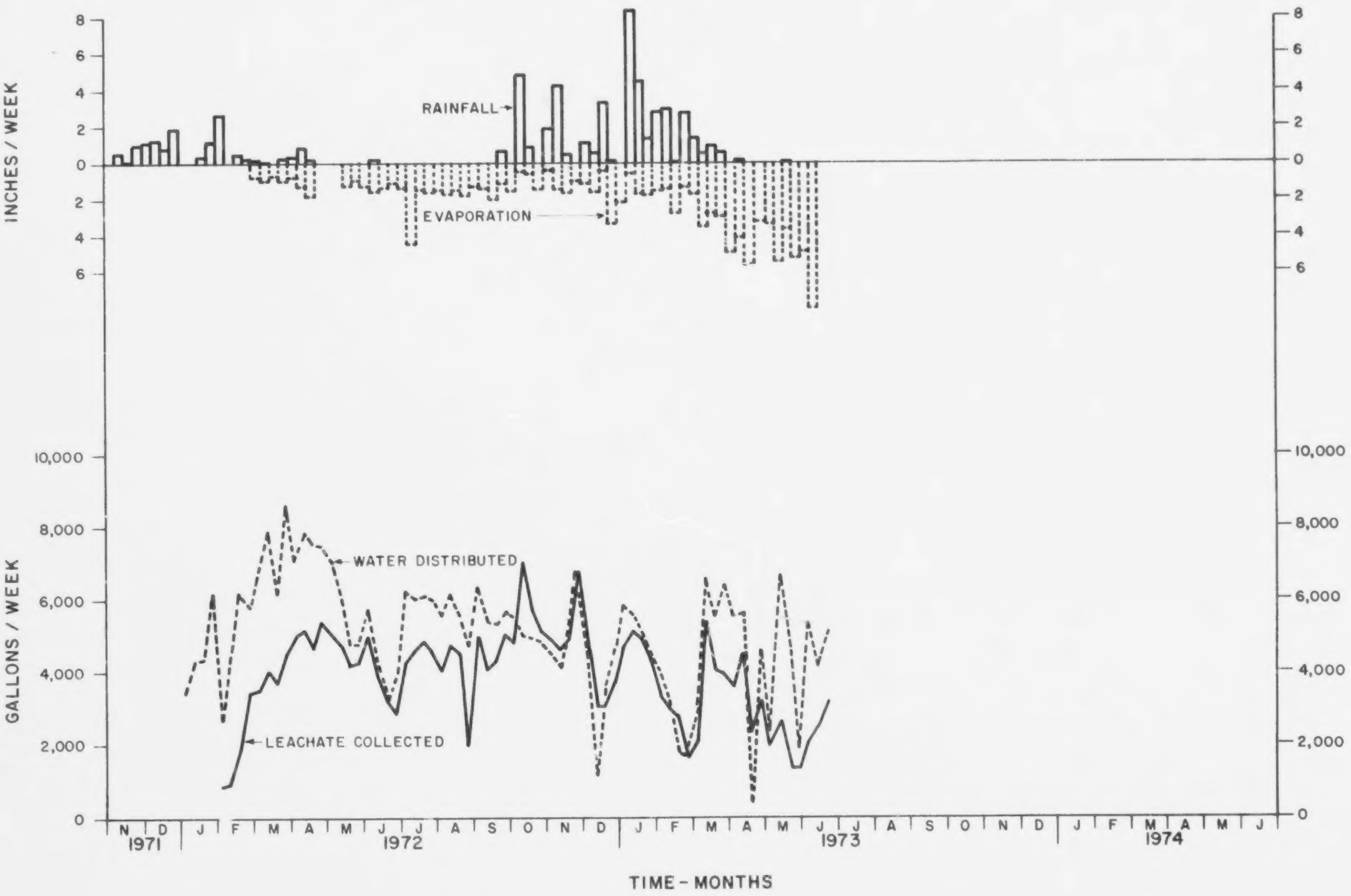
CUMULATIVE LEACHATE PRODUCTION - CELLS A, B & E

FIGURE 30



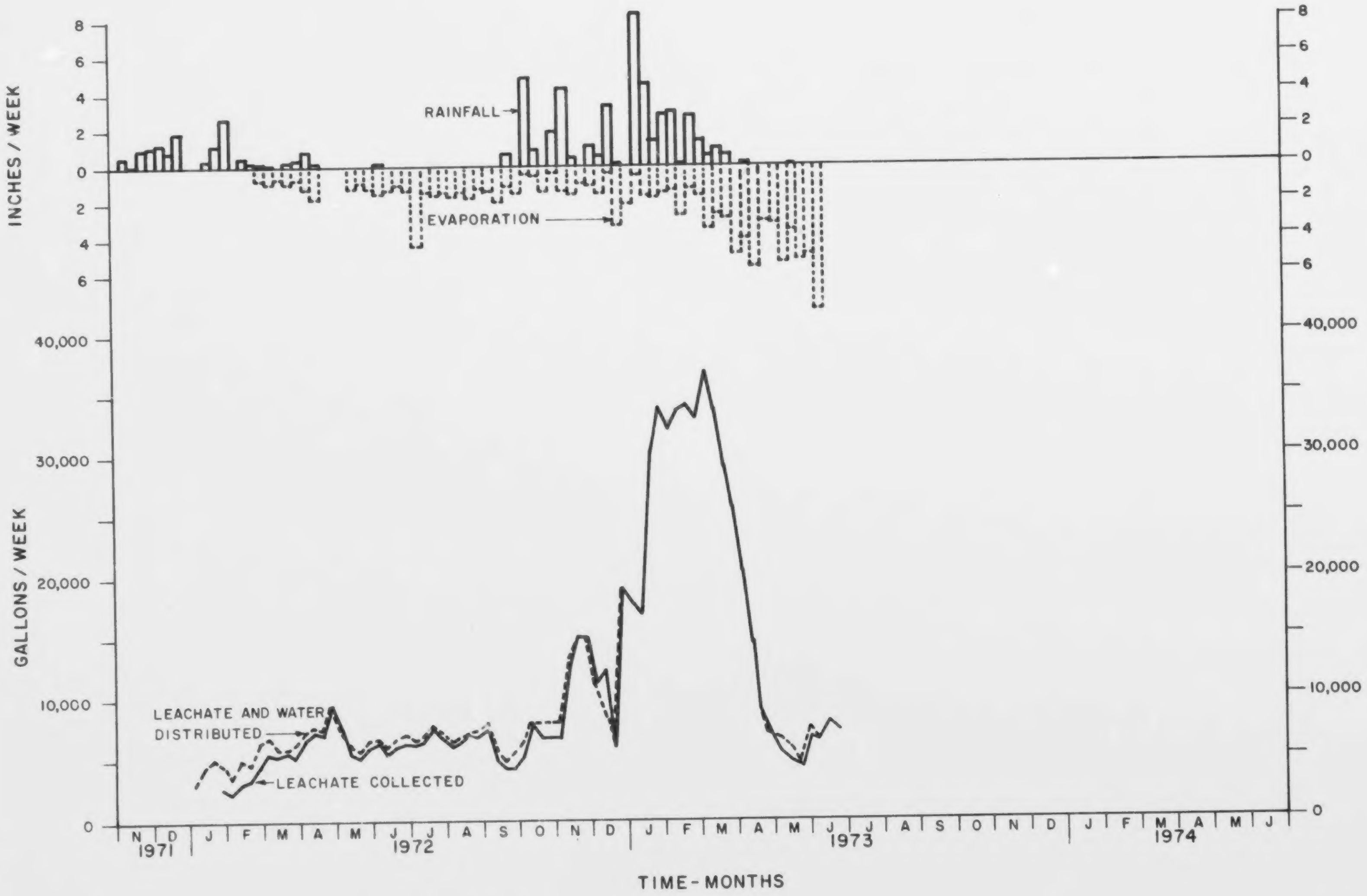
CUMMULATIVE WATER DISTRIBUTION AND LEACHATE COLLECTION – CELL "C"

FIGURE 31



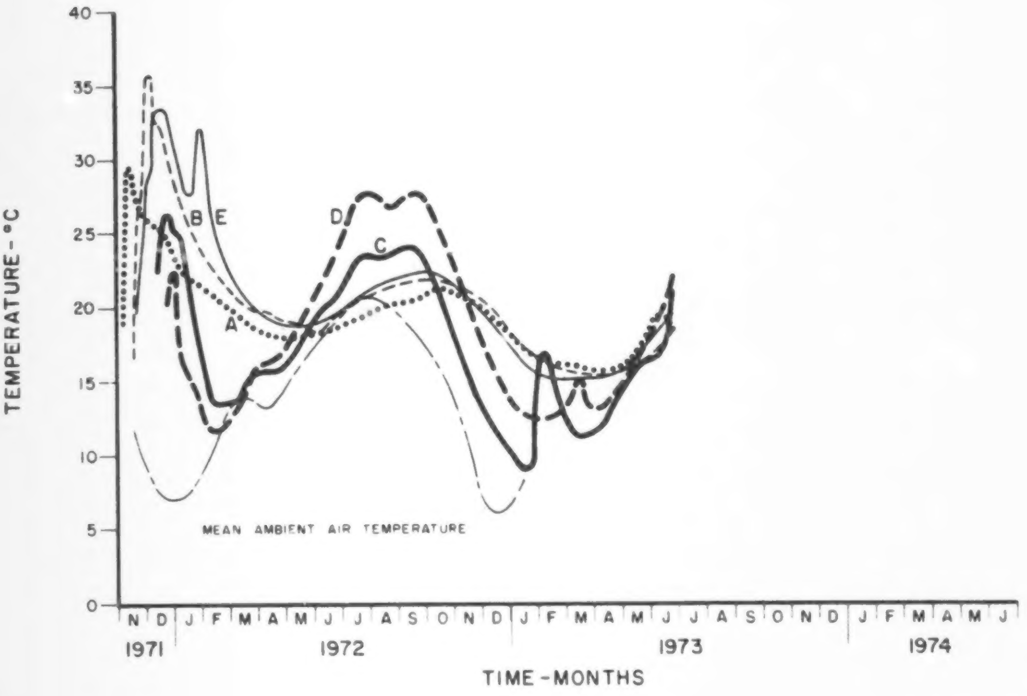
FLUID ROUTING - CELL "C"

FIGURE 32

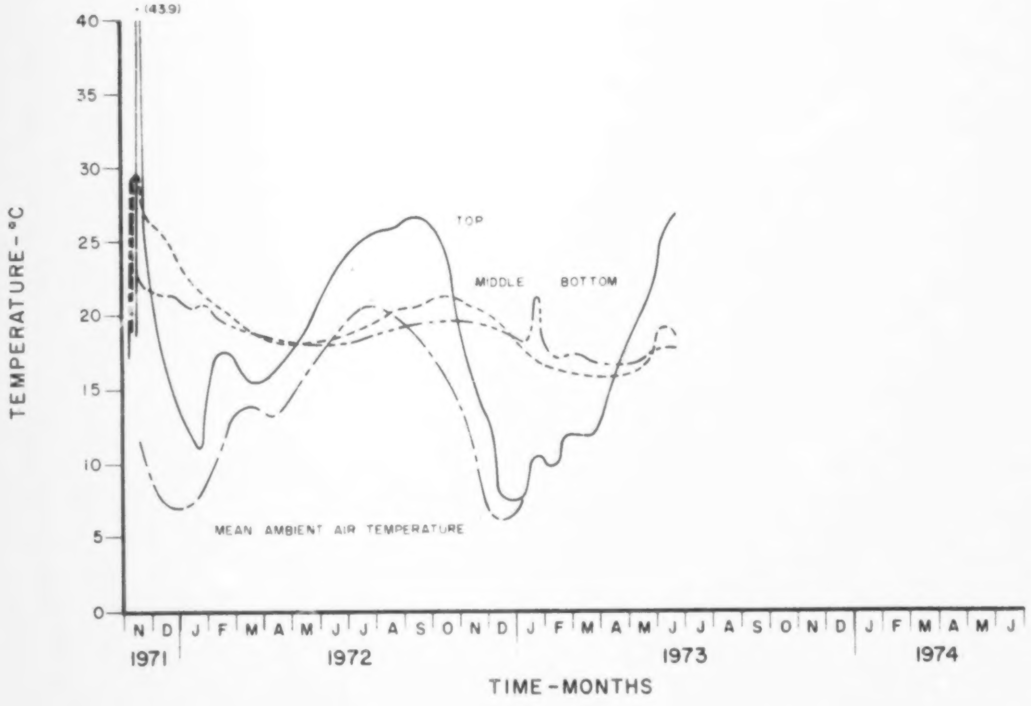


FLUID ROUTING - CELL "D"

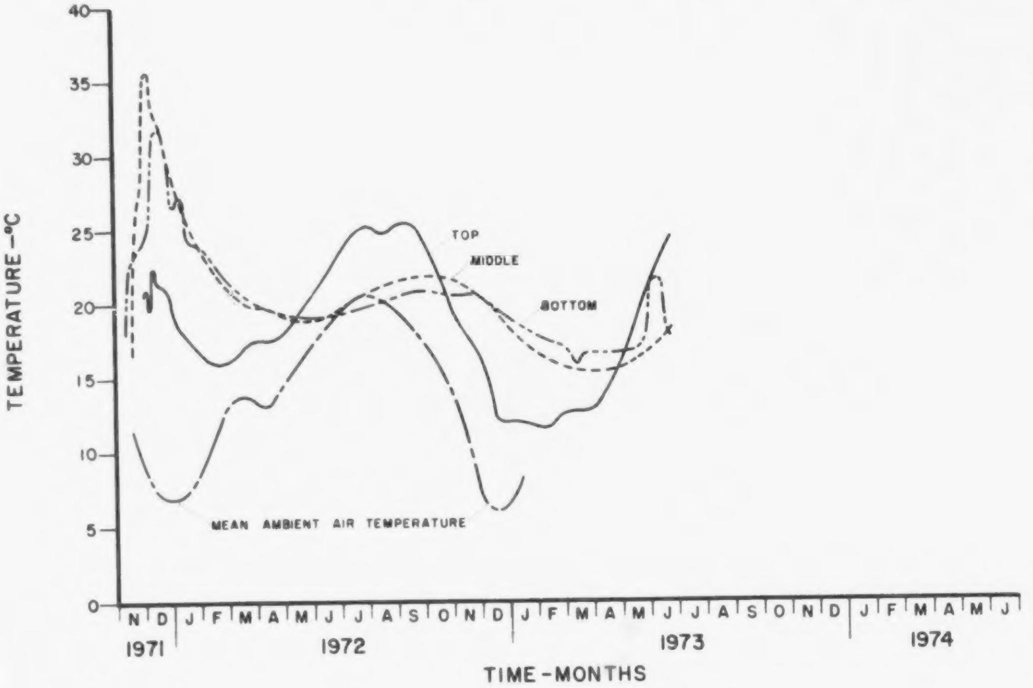
FIGURE 33



MIDDLE THERMISTOR TEMPERATURES – CELLS "A-E" FIGURE 34

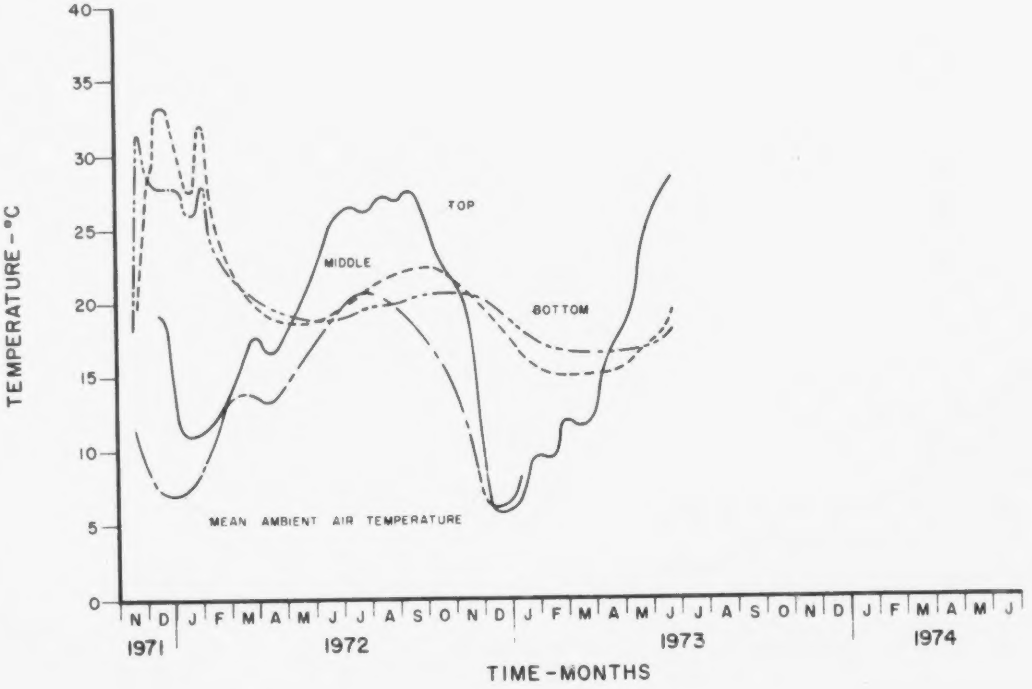


THERMISTOR TEMPERATURES – CELL "A" FIGURE 35



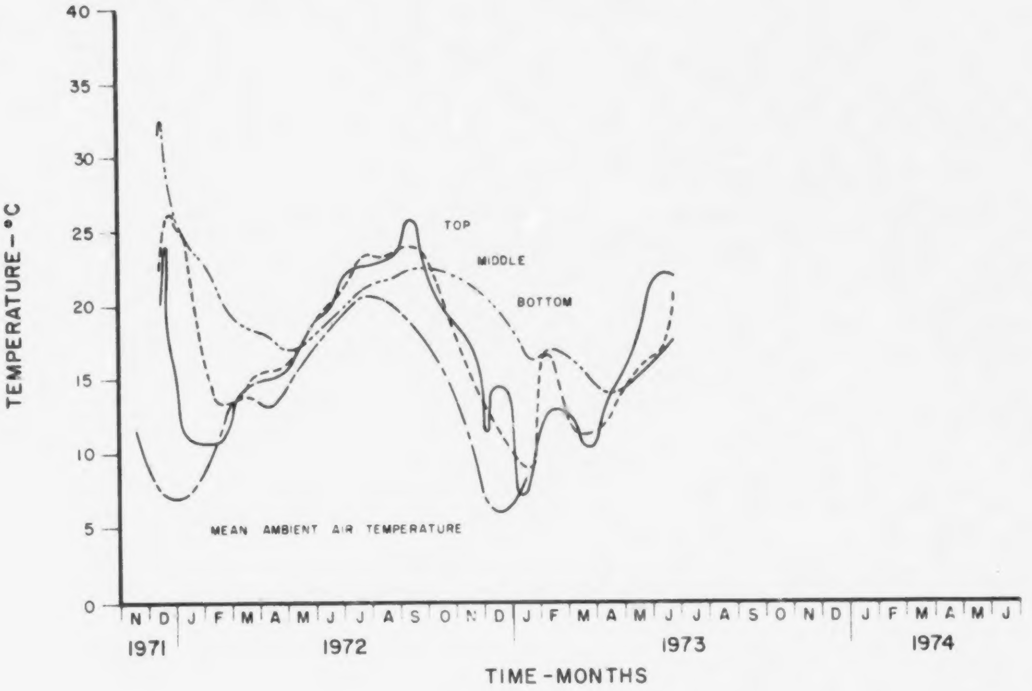
THERMISTOR TEMPERATURES-CELL "B"

FIGURE 36



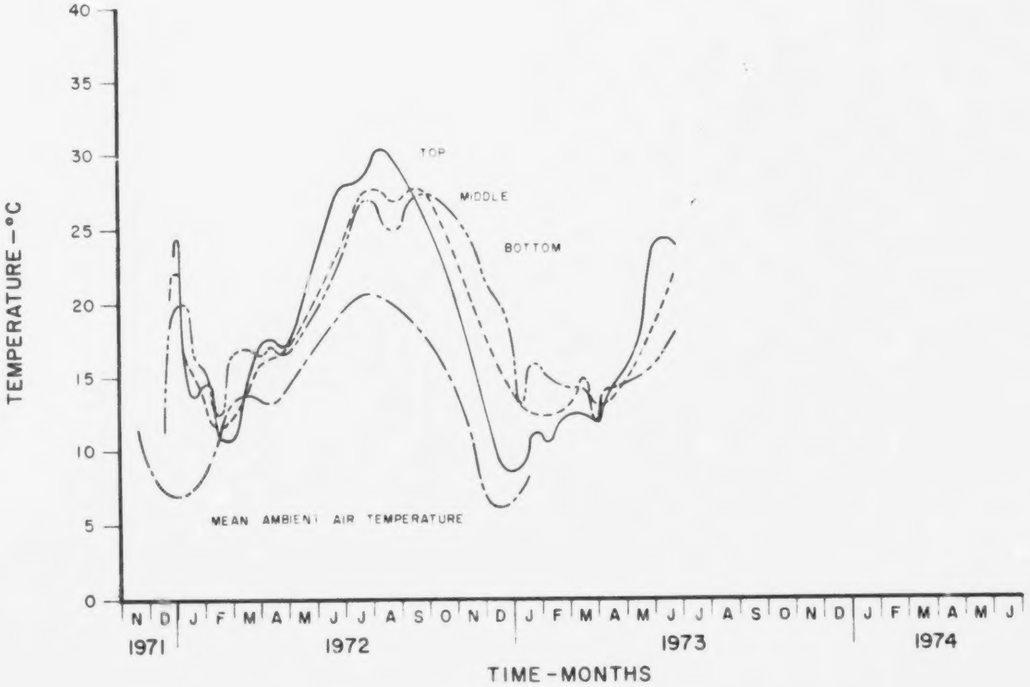
THERMISTOR TEMPERATURES-CELL "E"

FIGURE 37



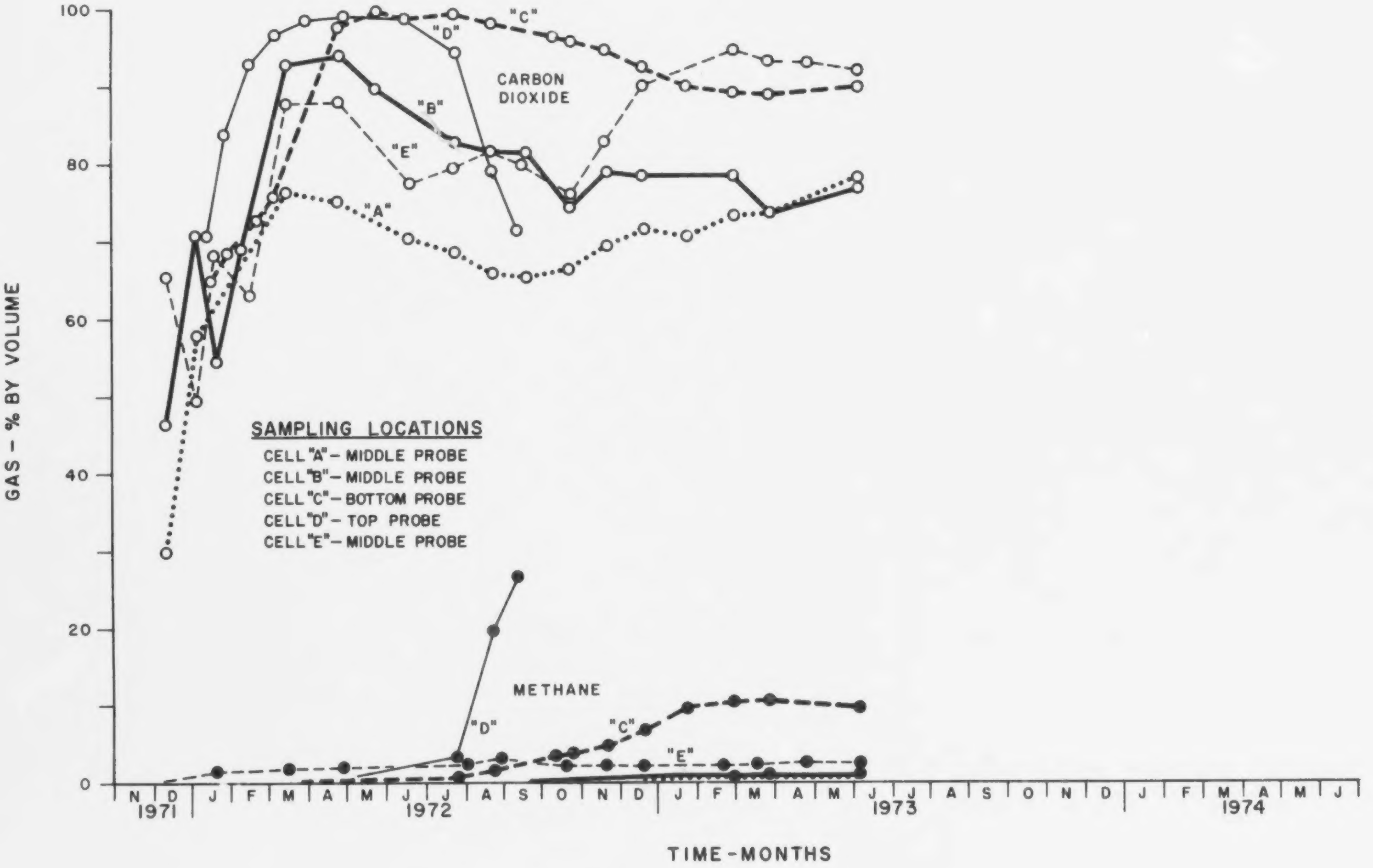
THERMISTOR TEMPERATURES—CELL "C"

FIGURE 38



THERMISTOR TEMPERATURES—CELL "D"

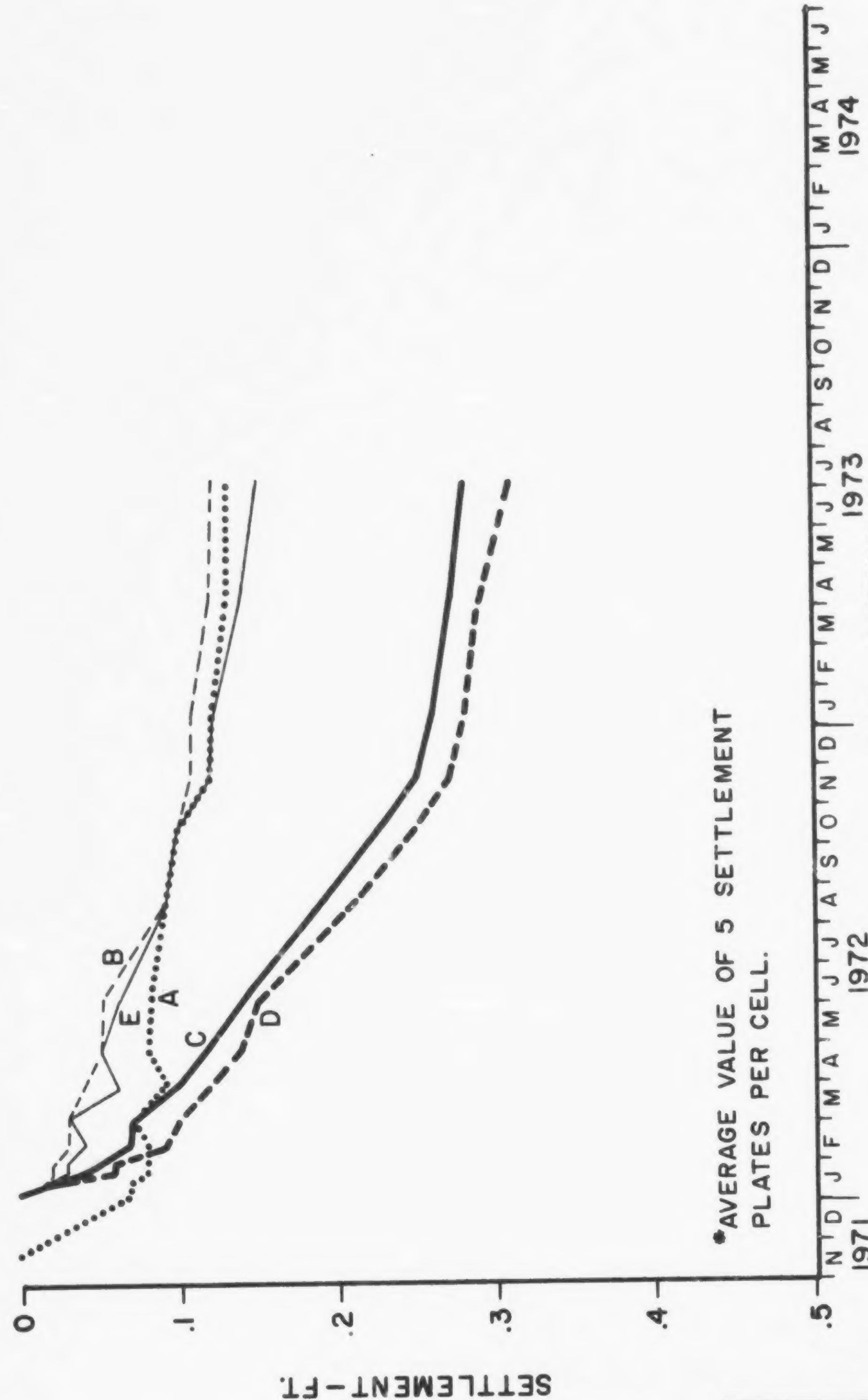
FIGURE 39



GAS COMPOSITION

FIGURE 40

FIGURE 41



*AVERAGE CELL SETTLEMENT

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 1

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	☆ Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Yellow Brown Sandy CLAY with roots to 8 inches; dry, hard. (Damp, very stiff to hard)
						2			
1.0	38	21	12.8		4.5+			X	
						4			(SC) Yellow Orange Clayey SAND with trace of fine gravel @ 4.0'; moist, stiff.
	31	14	15.6					X	
1.0					4.5+	6			(Firm)
						8			(Mottled gray with gravel to ½ inch in lense; very moist)
			15.7			10		X	(Blue-green, wet)
									Bottom of Trench- 11.0 feet.
						12			

REMARKS: Trench excavated with Drott Backhoe.

X - Indicates bulk sample obtained from trench

☆ - Penetration by pocket penetrometer

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FE 1 (8-71(

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 2

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penet-ration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY with roots to 8 inches; dry, hard.
	30	15	11.3					X	
						2			(Damp, very stiff)
1.0					4.5				
						4			(Yellow brown with trace of fine gravel; grading damp to moist, stiff)
0.9					3.5	6			(Mottled orange and gray)
	29	15	18.7			8		X	
						10			(lense gravel to ½")
						12			Bottom of Trench - 11.5 feet.

REMARKS: Trench excavated with Drott Backhoe.

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

FE 1 (8-71(

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 3

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY; grass roots to 8"; dry, hard (Traces of fine gravel)
0.4					4.5+	2			(Mottled orange; damp, very stiff)
						4			(Yellow brown, moist, stiff)
									(More sand)
			19.9			6		X	(Mottled orange and gray)
						8			
0.8					3.0	10			
						12			
									Bottom of Trench - 12.5 feet

REMARKS: Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

FE 1 (8-71(

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: FEET **BORING NO.** 4

	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples	DESCRIPTION
									(CL) Medium Brown Sandy CLAY with roots to 8"; dry, hard.
						2			(Damp, very stiff)
						4			(Mottled orange; moist, stiff)
								X	(Very moist)
	30	17	18.3			6			
						8			
			20.2					X	(Yellow brown; moist, stiff)
						10			Bottom of Trench - 9.5 feet

REMARKS:

Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

FE 1 (8-71(

LOG OF EXPLORATORY BORING

GROUND SURFACE ELEVATION: **FEET** **BORING NO.** 5

Tor-vane	Liquid Limit	Plasticity Index	Natural Moisture Content Percent	Dry Density Lbs./Cu.Ft.	* Penetration	Depth in Feet	Ground Water Levels	Samples		DESCRIPTION
									▨	(CL) Medium Brown Sandy CLAY with roots to 8"; dry, hard
0.4					4.5+	2			▨	(Mottled orange; damp, very stiff)
	39	24	15.6			4		X	▨	(Yellow brown mottled orange; moist, stiff)
1.0+					4.5+	6			▨	(Streaked gray)
			13.8			8		X	▨	(Trace of fine gravel)
						10			▨	
										Bottom of Trench - 11.0 feet
						12				

REMARKS:

Trench excavated with Drott Backhoe

X - Indicates bulk sample obtained from trench

* - Penetration by pocket penetrometer

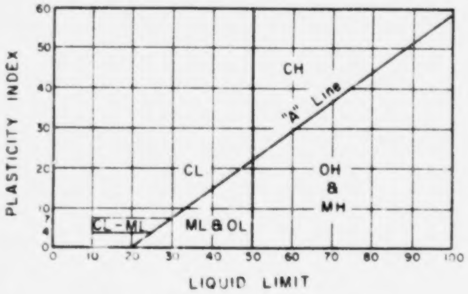
FE 1 (8-71(

MAJOR DIVISIONS		SYMBOLS		TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 1/2 of soil > no 200 sieve size)	**GRAVELS** (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	▓	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	░	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	░	Silty gravels, gravel-sand-silt mixtures
		GC	░	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW	░	Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM	▥	Silty sands, sand-silt mixtures
		SC	▨	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no 200 sieve size)	**SILTS & CLAYS** LL < 50	ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	▨	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	▥	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH	░	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	▨	Inorganic clays of high plasticity, fat clays
		OH	▨	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	▦	Peat and other highly organic soils

CLASSIFICATION CHART
(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U S Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse fine	3" to No 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse medium fine	No 4 to No 200 No 4 to No 10 No 10 to No 40 No 40 to No 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

METHOD OF SOIL CLASSIFICATION

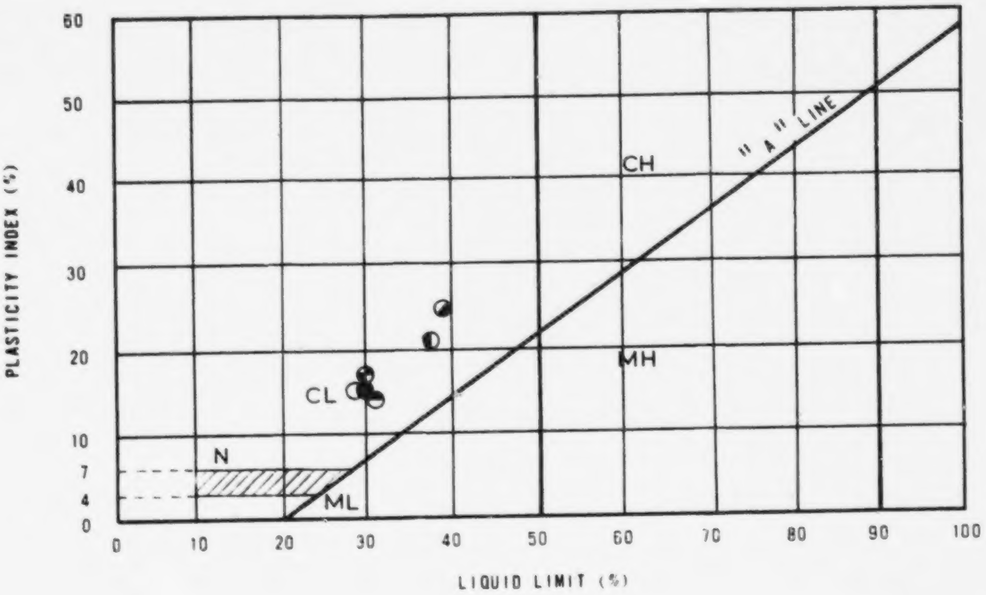
SUMMARY OF PERMEABILITY TESTS

TRENCH NO.	DEPTH ft.	DENSITY pcf	PERMEABILITY	
			@ 20°C cm/sec	ft./year
1	2.5-3.0	106.0	6.6×10^{-8}	0.066
4	5.5	112.4	2.3×10^{-7}	0.23
5	4.0	104.9	3.1×10^{-7}	0.31

SUMMARY OF SPECIFIC GRAVITY

TRENCH NO.	DEPTH ft.	SPECIFIC GRAVITY
1	2.5-3.0	2.78
	4.5-5.0	2.58

PLASTICITY CHART

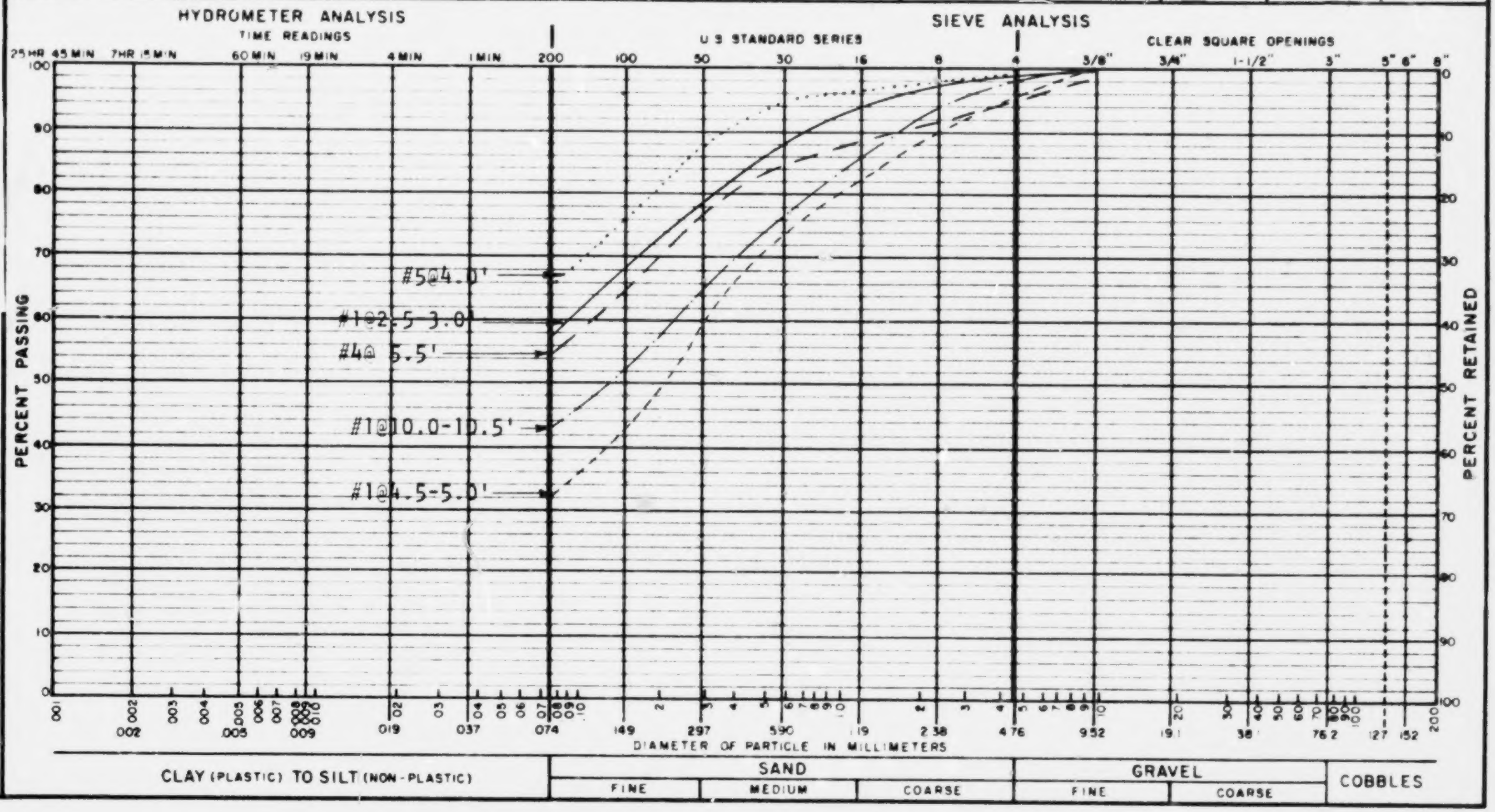


PLASTICITY DATA

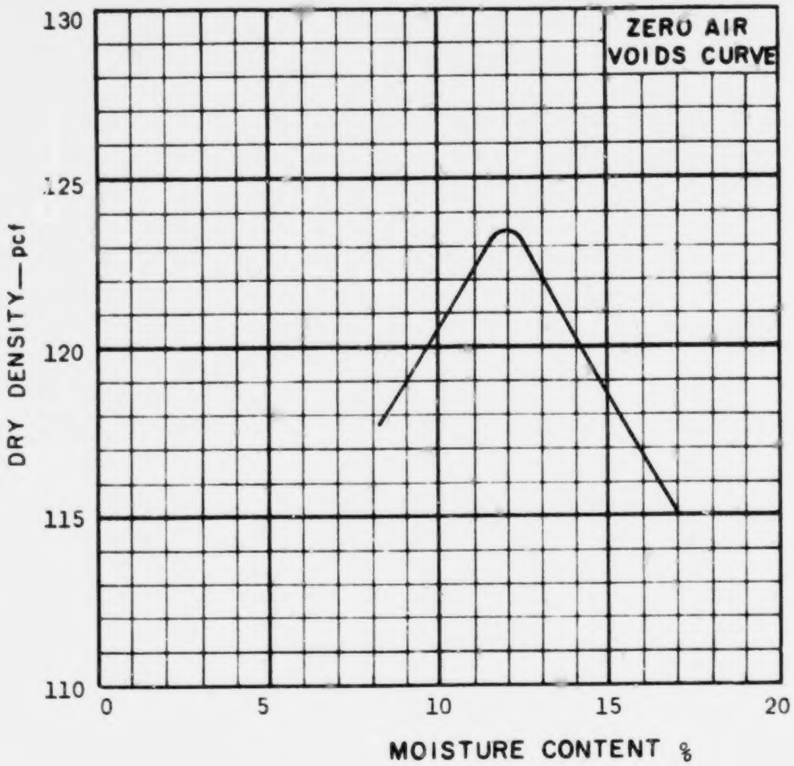
KEY SYMBOL	HOLE NO	DEPTH (feet)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	UNIFIED SOIL CLASSIFICATION SYMBOL
◐	1	2.5-3.0	38	21	CL
◒		4.5-5.0	31	14	SC
●	2	1.0-1.5	30	15	CL
○		8.0-9.0	29	15	CL
◕	4	5.5	30	17	CL
◩	5	4.0	39	24	CL

GRADATION TEST RESULTS

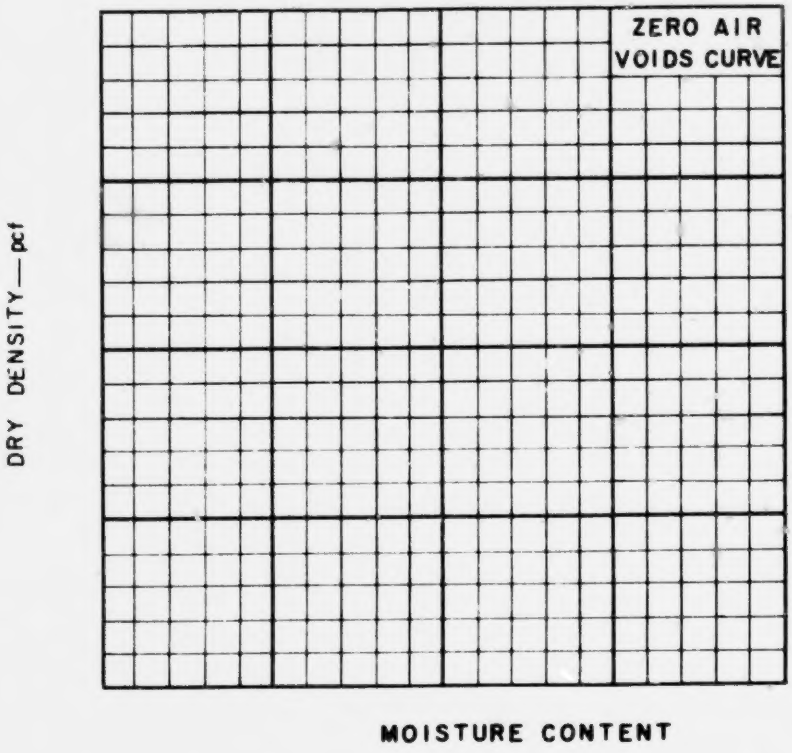
LL	38	31	-	30	29	-	30	-	39	-
PL	17	17	-	15	14	-	13	-	15	-
PI	21	14	-	15	15	-	17	-	24	-
NAT. W/C	12.8	15.6	15.7	11.3	18.7	19.9	13.3	20.2	15.6	13.8
CLASSIF SYMB	CL	SC	SC	CL	CL		CL	CL	CL	-
SAMPLE NO.	1	2	3	1	2	1	1	2	1	2
DEPTH FT	2.5-3.0	4.5-5.0	10.0-10.5	1.0-1.5	8.0-9.0	6.0-7.0	5.5	9.0	4.0	8.5
HOLE NO.	1	1	1	2	2	3	4	4	5	5



COMPACTION TEST



SAMPLE NO.
1
SAMPLE DEPTH
2.5' - 3.0'
SAMPLE DESCRIPTION
Brown Sandy
CLAY
SPECIFIC GRAVITY
2.78
TEST DESIGNATION
D1557-70
MAXIMUM DRY DENSITY (pcf)
123.5
OPTIMUM MOISTURE CONTENT, %
12.0



SAMPLE NO.
SAMPLE DEPTH
SAMPLE DESCRIPTION
SPECIFIC GRAVITY
TEST DESIGNATION
MAXIMUM DRY DENSITY (pcf)
OPTIMUM MOISTURE CONTENT, %

APPENDIX B

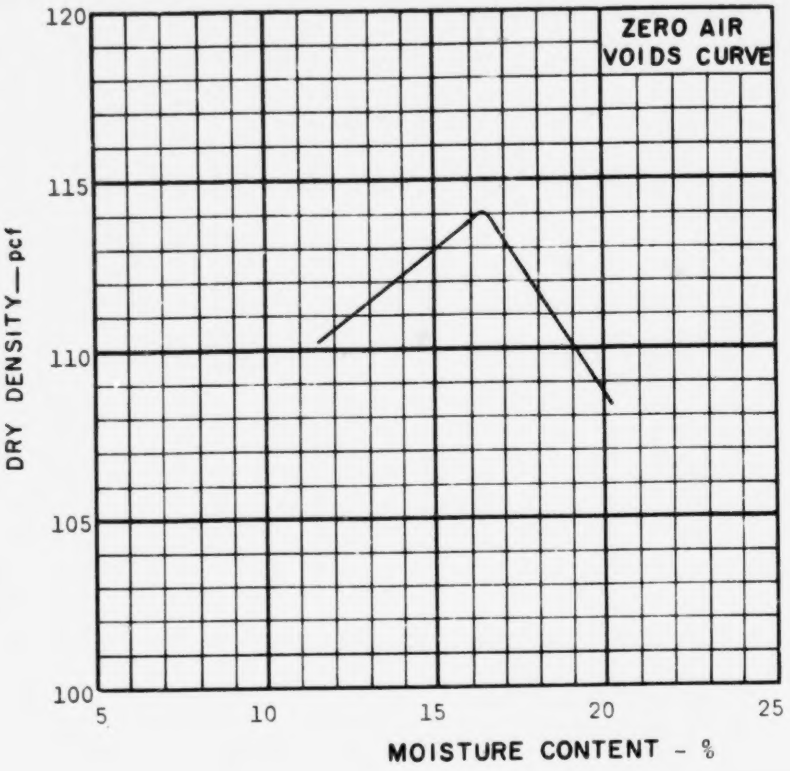
TEST CELL CONSTRUCTION DATA

TABLE A

SUMMARY OF FIELD DENSITY TEST RESULTS

TEST NO.	DATE OF TEST	APPROX. DEPTH OF FILL (feet)	LOCATION	APPROX. ELEVATION (feet)	FIELD		MAXIMUM LAB DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	REMARKS
					DRY DENSITY (pcf)	WATER CONTENT (%)			
1	1971 10-1	2.0	See Plot Plan	297.0	113.0	13.0	114.0	99.0	Cells B,C,D
2	10-1	2.0	See Plot Plan	297.0	115.5	13.6	114.0	101.5	Cells B,C,D
3	10-6	3.0	See Plot Plan	298.0	110.0	13.5	114.0	96.5	Cells B,C,D
4	10-8	4.5	See Plot Plan	299.5	118.0	15.0	114.0	103.5	Cells B,C,D
5	10-11	5.5	See Plot Plan	300.5	110.0	15.6	114.0	97.0	Cells B,C,D
6	10-18	4.5	See Plot Plan	300.5	115.0	18.6	114.0	102.0	Cells B,C,D
7	10-18	3.5	See Plot Plan	301.5	113.0	19.2	114.0	99.0	Cells B,C,D
8	10-18	2.5	See Plot Plan	302.5	119.5	11.3	114.0	105.0	Cells B,C,D
9	10-18	2.0	See Plot Plan	303.0	106.0	21.2	114.0	93.0	Cells B,C,D
10	10-18	1.0	See Plot Plan	304.0	114.0	17.1	114.0	100.0	Cells B,C,D
11	10-18	1.0	See Plot Plan	304.0	115.2	19.5	114.0	101.0	Cells B,C,D
12	10-18	2.0	See Plot Plan	303.0	109.0	19.2	114.0	96.0	Cells B,C,D
13	10-18	1.5	See Plot Plan	277.5	121.2	11.7	114.0	106.0	Cells A & E
14	10-18	2.0	See Plot Plan	277.0	113.2	18.8	114.0	99.5	Cells A & E
15	10-18	1.0	See Plot Plan	278.0	110.2	16.2	114.0	97.0	Cells A & E
16	10-18	5.0	See Plot Plan	275.5	115.0	10.9	114.0	101.0	Cells A & E
17	10-18	5.0	See Plot Plan	275.0	111.0	17.1	114.0	97.5	Cells A & E
18	10-18	5.0	See Plot Plan	276.5	108.0	20.8	114.0	94.5	Re-worked & Accepted
19	10-18	0.0	See Plot Plan	278.0	110.5	14.0	114.0	97.0	Cells A & E

COMPACTION TEST



SAMPLE NO.
Stockpile

SAMPLE DEPTH
-

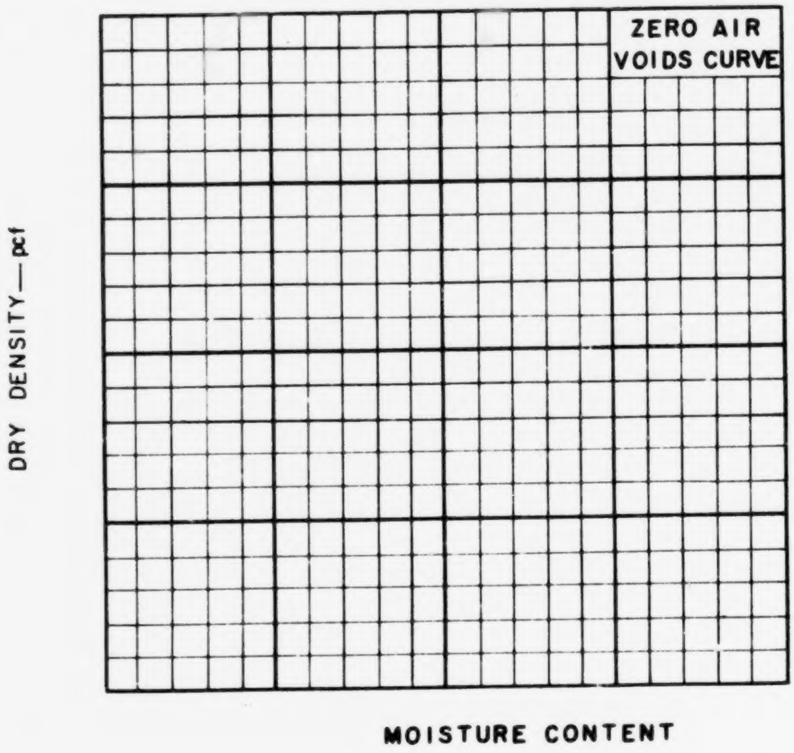
SAMPLE DESCRIPTION
Brown clayey
fine SAND

SPECIFIC GRAVITY
2.75 (est.)

TEST DESIGNATION
D 698-70

MAXIMUM DRY DENSITY (pcf)
114.0

OPTIMUM MOISTURE CONTENT, %
16.3



SAMPLE NO.

SAMPLE DEPTH

SAMPLE DESCRIPTION

SPECIFIC GRAVITY

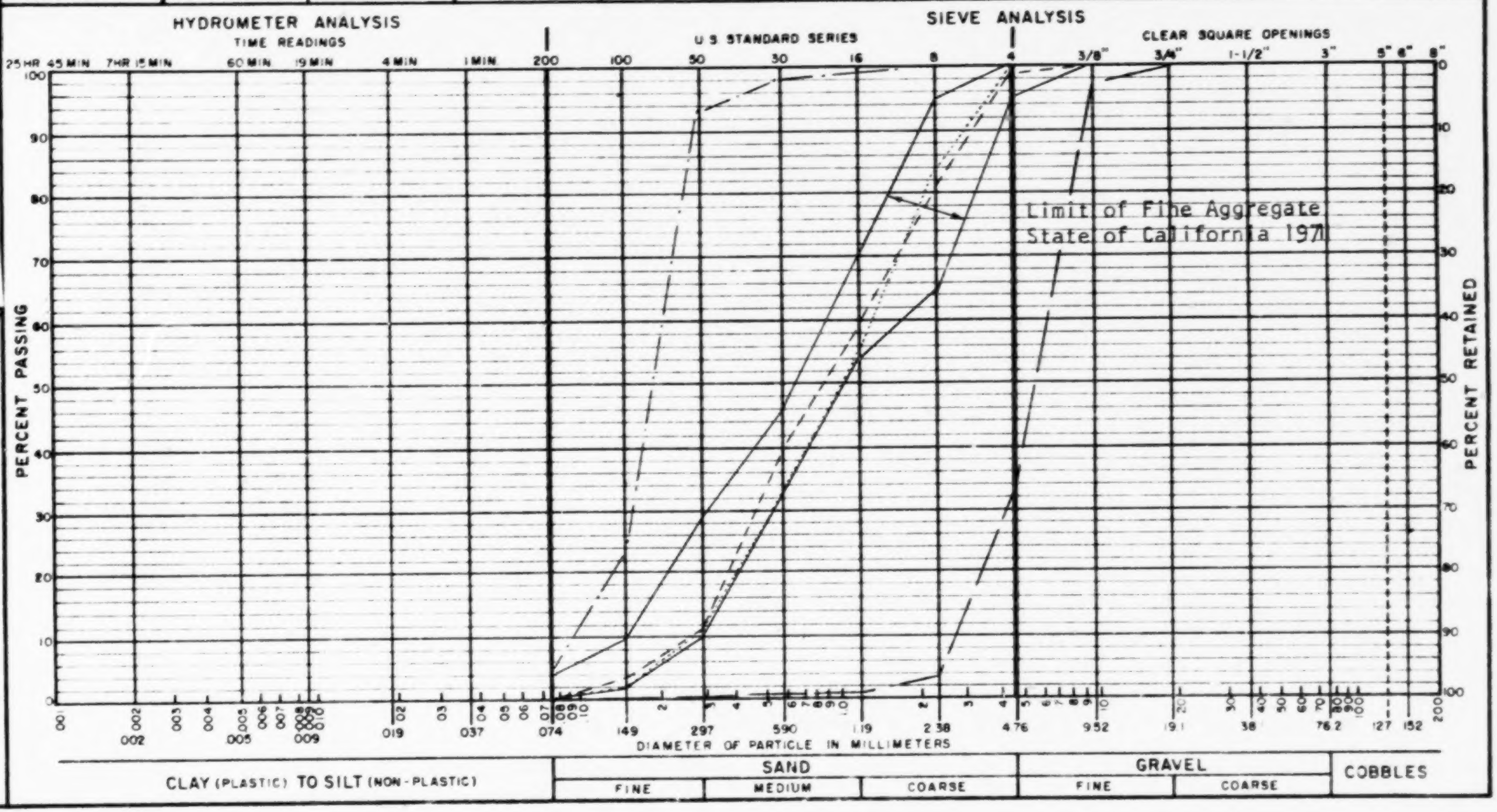
TEST DESIGNATION

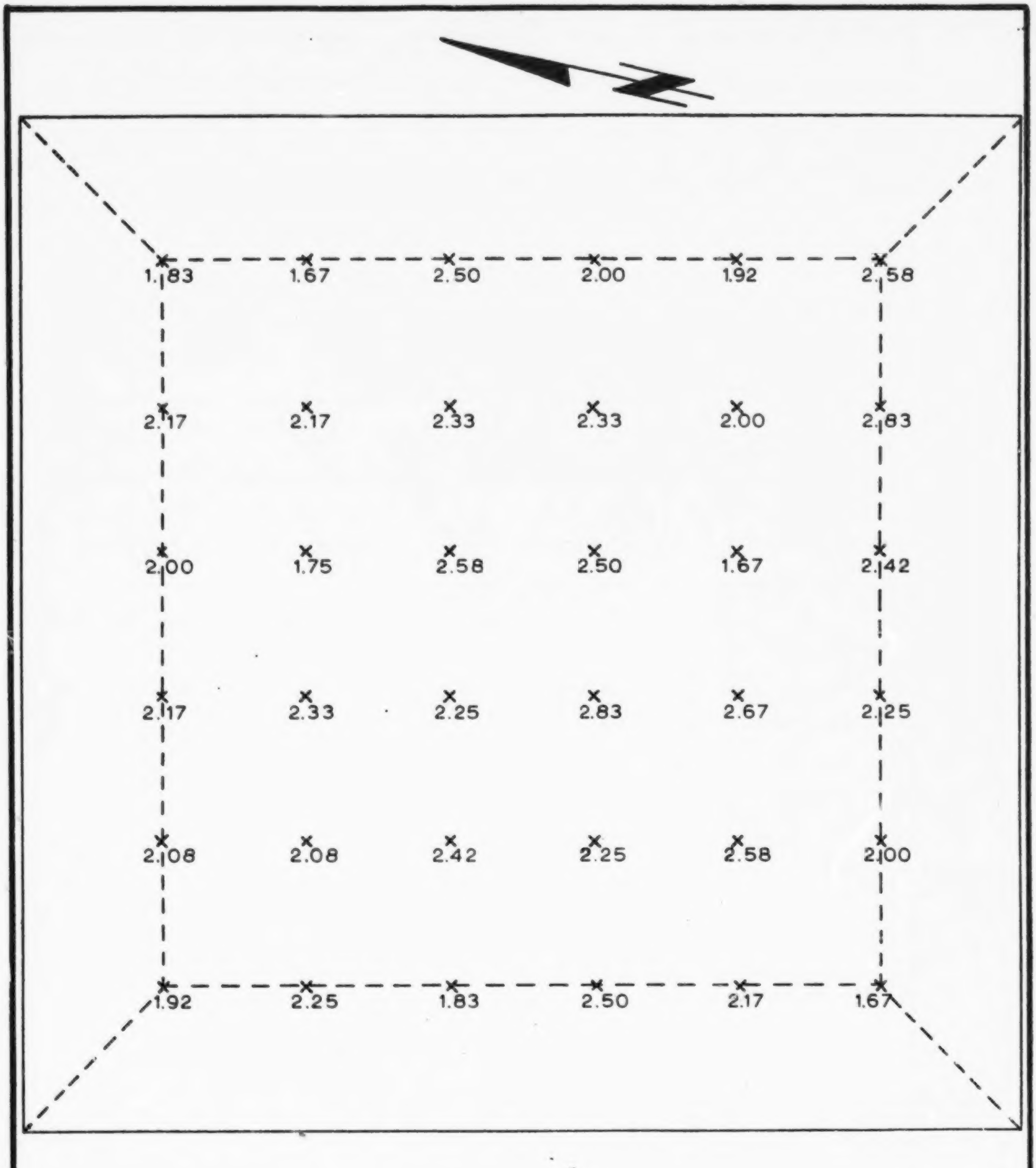
MAXIMUM DRY DENSITY (pcf)

OPTIMUM MOISTURE CONTENT, %

GRADATION TEST RESULTS

SYMBOL	……………	– – – – –	—·—·—	———					
LL									
PL									
PI									
NAT. W/C									
CLASSIF. SYMB.									
SAMPLE NO.	Concrete Sand	Concrete Sand	Muck Sand	Pea Gravel					
DEPTH FT									
HOLE NO.	Kaiser	Basalt	Basalt	Cell D					

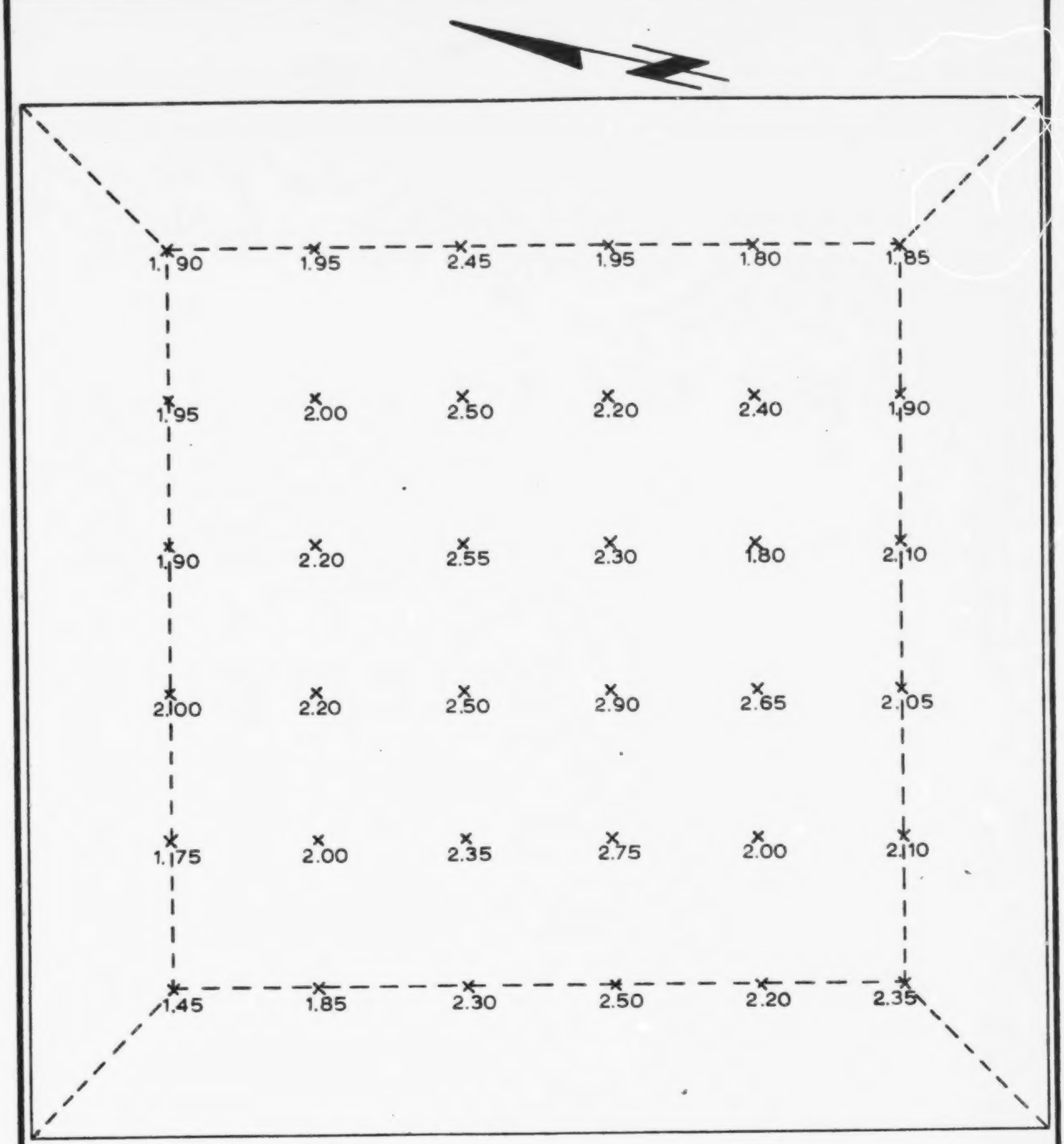



1.83
1.67
2.50
2.00
1.92
2.58
2.17
2.17
2.33
2.33
2.00
2.83
2.00
1.75
2.58
2.50
1.67
2.42
2.17
2.33
2.25
2.83
2.67
2.25
2.08
2.08
2.42
2.25
2.58
2.00
1.92
2.25
1.83
2.50
2.17
1.67

CELL 'A'
COVER THICKNESS IN FEET

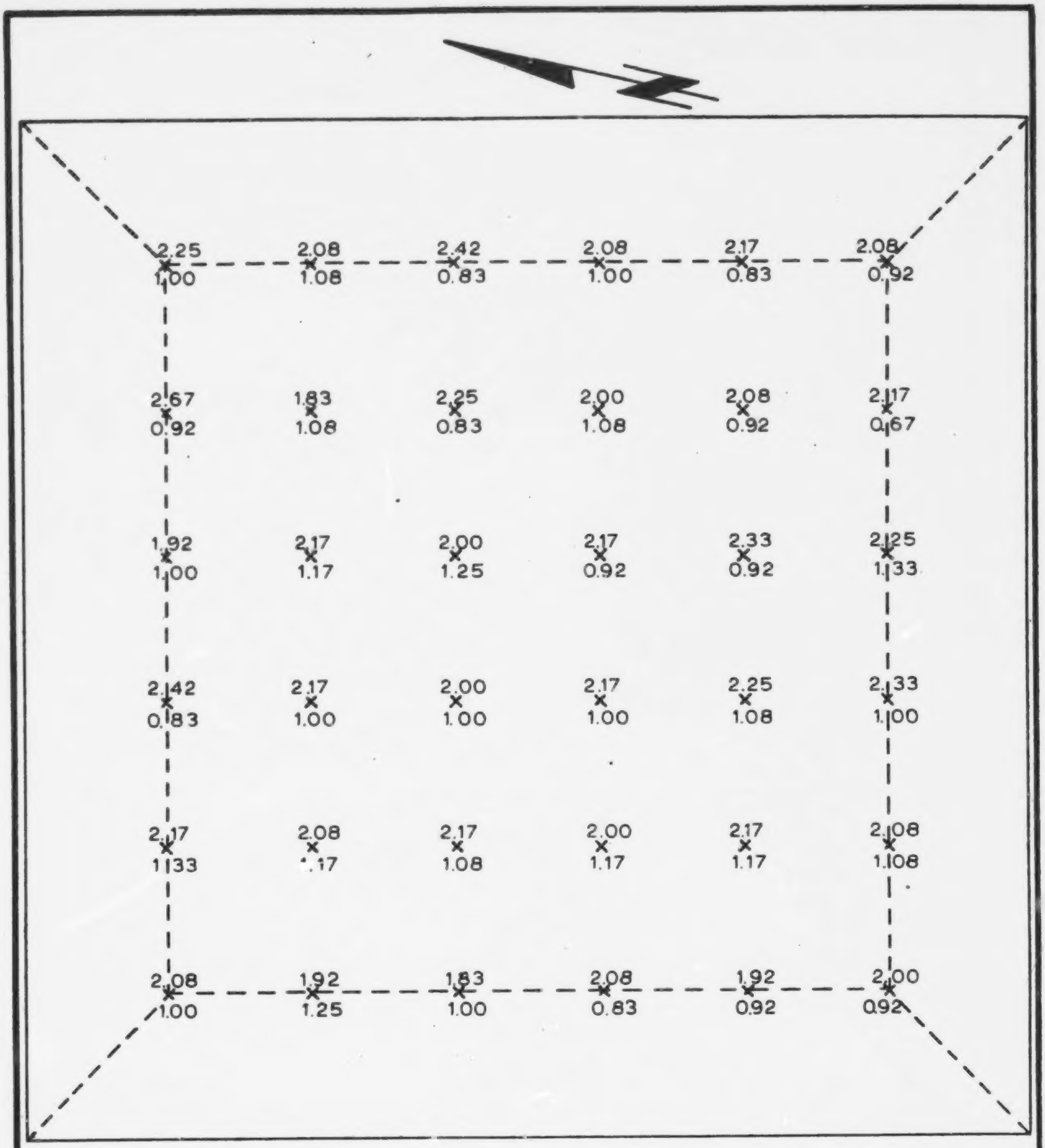
SCALE: 1 inch = 10 feet

TI 1(8-71)


1.90
1.95
2.45
1.95
1.80
1.85
1.95
2.00
2.50
2.20
2.40
1.90
1.90
2.20
2.55
2.30
1.80
2.10
2.00
2.20
2.50
2.90
2.65
2.05
1.75
2.00
2.35
2.75
2.00
2.10
1.45
1.85
2.30
2.50
2.20
2.35

CELL 'B'
COVER THICKNESS IN FEET

SCALE: 1 inch = 10 feet

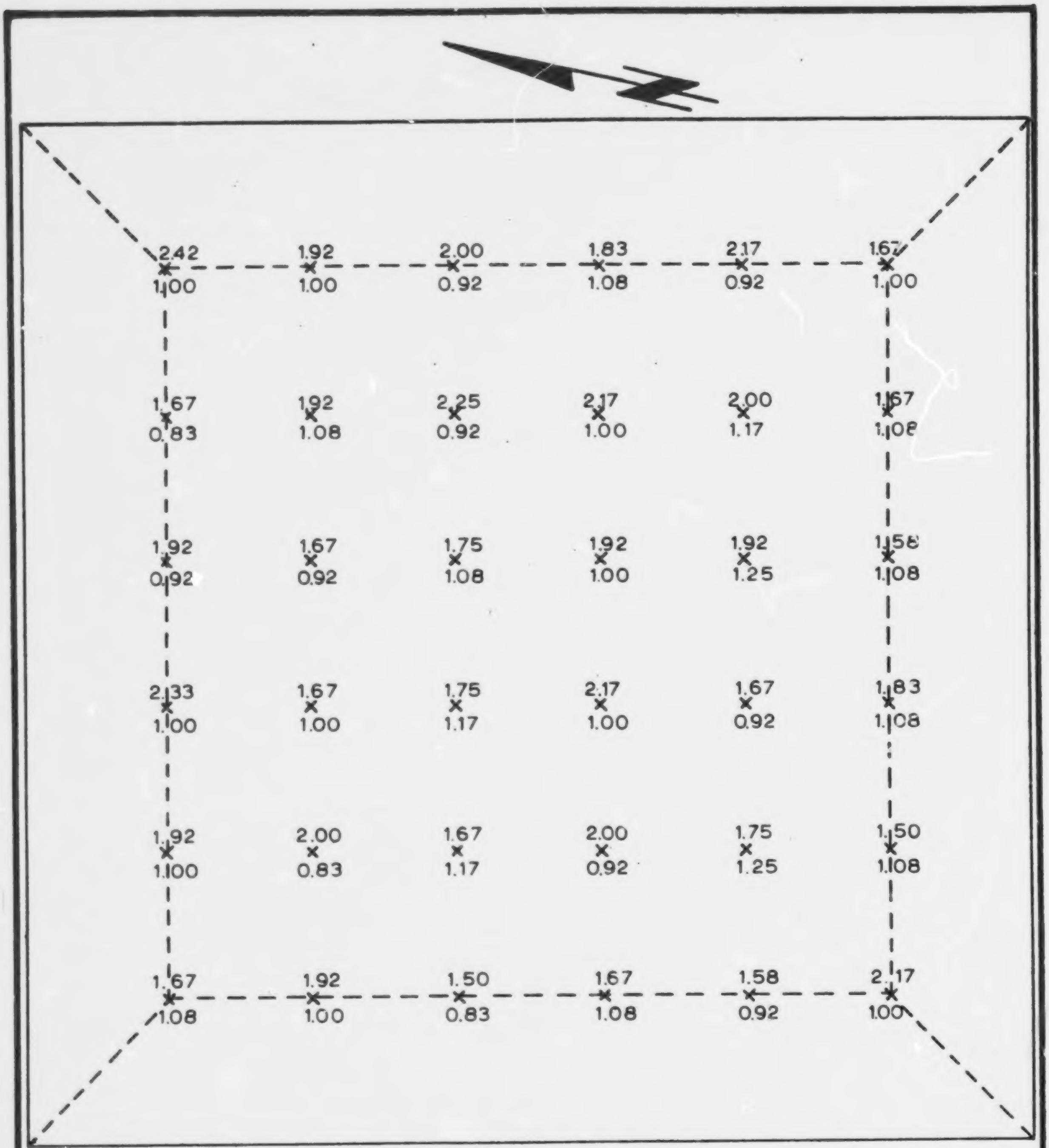

2.25 1.00
2.08 1.08
2.42 0.83
2.08 1.00
2.17 0.83
2.08 0.92
2.67 0.92
1.83 1.08
2.25 0.83
2.00 1.08
2.08 0.92
2.17 0.67
1.92 1.00
2.17 1.17
2.00 1.25
2.17 0.92
2.33 0.92
2.25 1.33
2.42 0.83
2.17 1.00
2.00 1.00
2.17 1.00
2.25 1.08
2.33 1.00
2.17 1.33
2.08 1.17
2.17 1.08
2.00 1.17
2.17 1.17
2.08 1.08
2.08 1.00
1.92 1.25
1.83 1.00
2.08 0.83
1.92 0.92
2.00 0.92

CELL 'C'
COVER THICKNESS IN FEET

LEGEND

2.25 Thickness of Soil Cover
×
1.00 Thickness of Sand Cover

SCALE: 1 inch = 10 feet

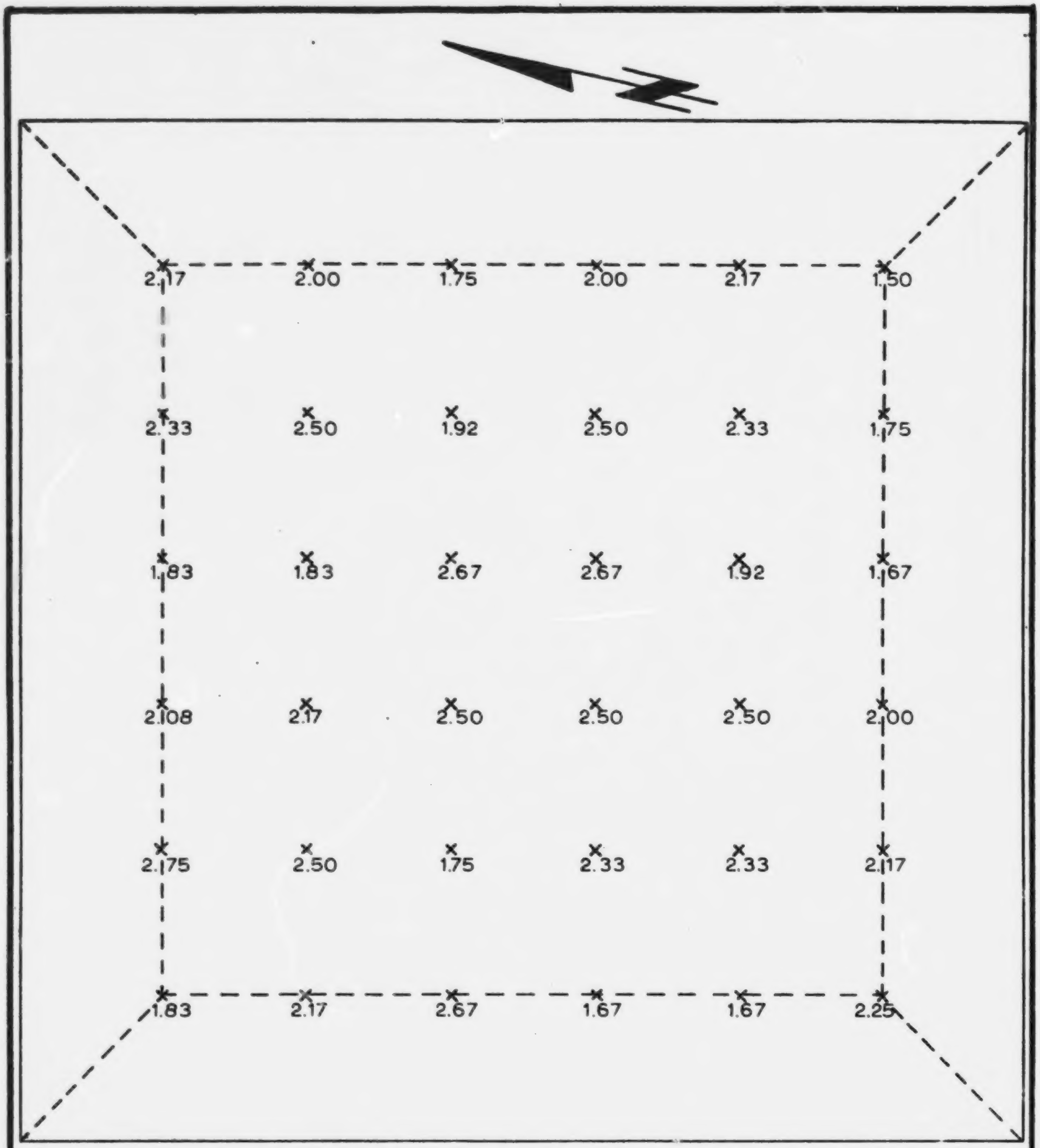

2.42 × 1.00
1.92 × 1.00
2.00 × 0.92
1.83 × 1.08
2.17 × 0.92
1.67 × 1.00
1.67 × 0.83
1.92 × 1.08
2.25 × 0.92
2.17 × 1.00
2.00 × 1.17
1.67 × 1.08
1.92 × 0.92
1.67 × 0.92
1.75 × 1.08
1.92 × 1.00
1.92 × 1.25
1.58 × 1.08
2.33 × 1.00
1.67 × 1.00
1.75 × 1.17
2.17 × 1.00
1.67 × 0.92
1.83 × 1.08
1.92 × 1.00
2.00 × 0.83
1.67 × 1.17
2.00 × 0.92
1.75 × 1.25
1.50 × 1.08
1.67 × 1.08
1.92 × 1.00
1.50 × 0.83
1.67 × 1.08
1.58 × 0.92
2.17 × 1.00

CELL 'D'
COVER THICKNESS IN FEET

LEGEND

2.42	Thickness of Soil Cover
×	
1.00	Thickness of Pea Gravel Cover

SCALE: 1 inch = 10 feet


2.17
2.00
1.75
2.00
2.17
1.50
2.33
2.50
1.92
2.50
2.33
1.75
1.83
1.83
2.67
2.67
1.92
1.67
2.08
2.17
2.50
2.50
2.50
2.00
2.75
2.50
1.75
2.33
2.33
2.17
1.83
2.17
2.67
1.67
1.67
2.25

CELL 'E'
COVER THICKNESS IN FEET

SCALE: 1 inch = 10 feet

TI 1(8-71)

APPENDIX C

CLAY BARRIER CONSTRUCTION DATA

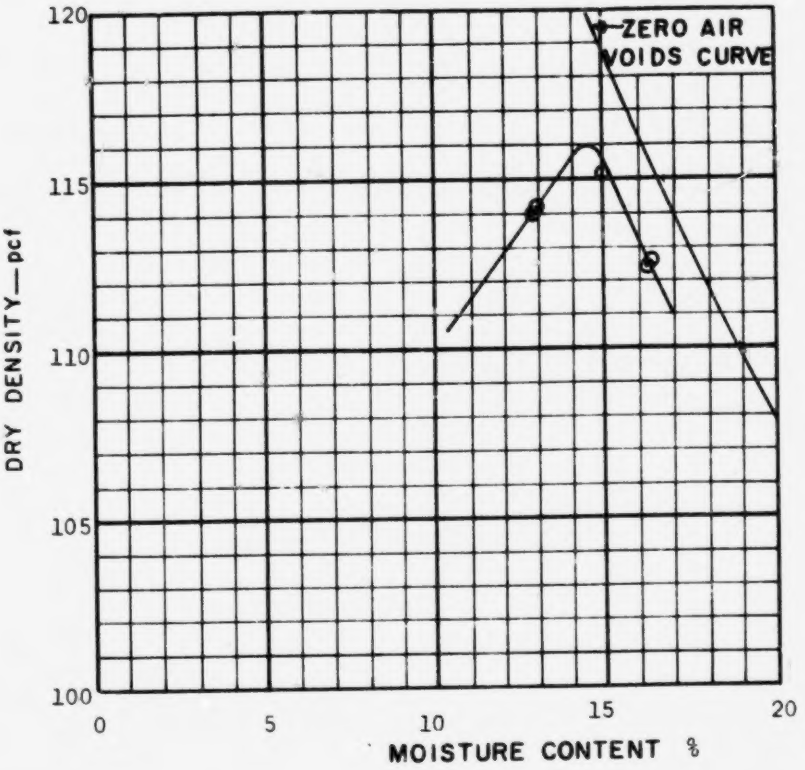
TABLE A

SUMMARY OF FIELD DENSITY TEST RESULTS

TEST NO.	DATE OF TEST 1971	APPROX. DEPTH OF FILL (feet)	LOCATION	APPROX. ELEVATION ((feet))	FIELD DRY DENSITY (pcf)	FIELD WATER CONTENT (%)	MAXIMUM LAB DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	REMARKS
1	8/10	4.5	Barrier Core	190.5	118.7	16.4	116.0	103	
2	8/10	3.5	Barrier Core	189.5	114.0	15.8	116.0	99	Re-worked & Accepted
3	8/10	2.0	Barrier Core	187.0	113.2	17.4	116.0	98	" "
4	8/10	6.0	Barrier Core	192.0	113.7	15.1	116.0	99	" "
5	8/10	7.0	Barrier Core	193.0	111.5	16.4	116.0	97	" "
6	8/11	7.5	Barrier Core	193.5	114.2	15.5	116.0	99	" "
7	8/11	8.5	Barrier Core	194.0	117.2	15.6	116.0	101	
8	8/11	9.0	Barrier Core	194.0	117.7	16.4	116.0	102	
9	8/11	10.0	Barrier Core	195.0	122.2	15.3	116.0	105	
10	8/11	10.0	Barrier Core	195.0	119.5	15.5	116.0	103	
11	8/11	9.0	Barrier Core	194.0	120.0	15.0	116.0	104	Sand Cone Density Test Method
12	8/11	10.0	Barrier Core	195.0	118.0	15.6	116.0	102	
13	8/16	11.0	Barrier Core	196.0	119.7	15.7	116.0	103	
14	8/16	12.0	Barrier Core	197.0	117.0	15.4	116.0	101	
15	8/17	13.0	Barrier Core	198.0	119.2	15.7	116.0	103	
16	8/17	14.0	Barrier Core	199.0	117.2	16.4	116.0	101	
17	8/17	15.0	Barrier Core	200.00	121.2	15.4	116.0	105	
18	8/18	16.5	Barrier Core	201.5	118.0	16.2	116.0	102	
19	8/18	17.5	Barrier Core	202.5	113.7	17.4	116.0	98	
20	8/18	18.5	Barrier Core	203.5	116.2	19.3	116.0	100	
21	8/18	19.5	Barrier Core	204.5	122.5	15.9	116.0	105	

NOTE: All field density determination by nuclear method except as noted.

COMPACTION TEST



SAMPLE NO.
Composite

SAMPLE DEPTH
From Stockpile

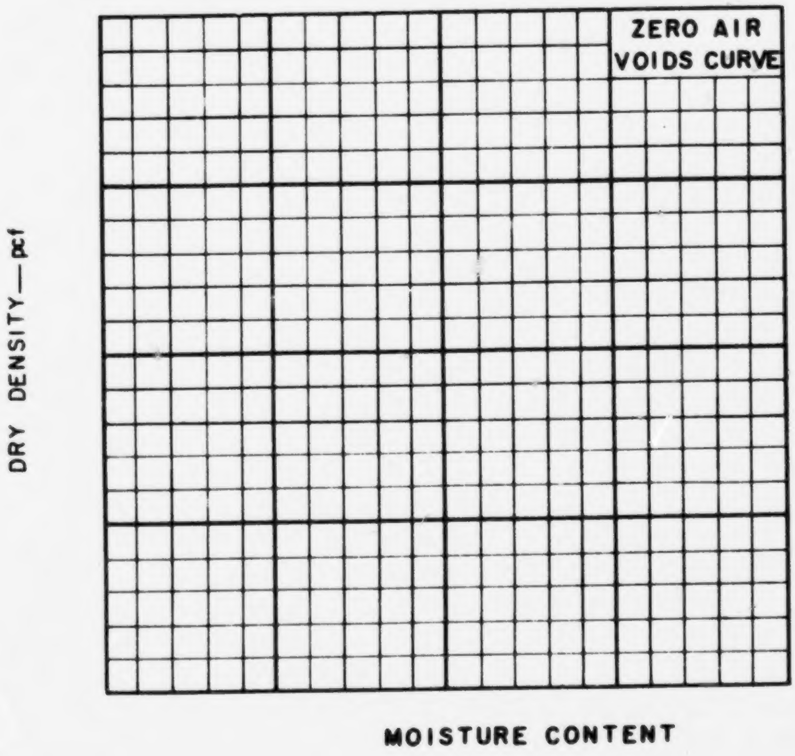
SAMPLE DESCRIPTION
Brown, Sandy
CLAY

SPECIFIC GRAVITY
2.65 (est.)

TEST DESIGNATION
ASTM D698-70

MAXIMUM DRY DENSITY (pcf)
116.0

OPTIMUM MOISTURE CONTENT, %
14.5



SAMPLE NO.

SAMPLE DEPTH

SAMPLE DESCRIPTION

SPECIFIC GRAVITY

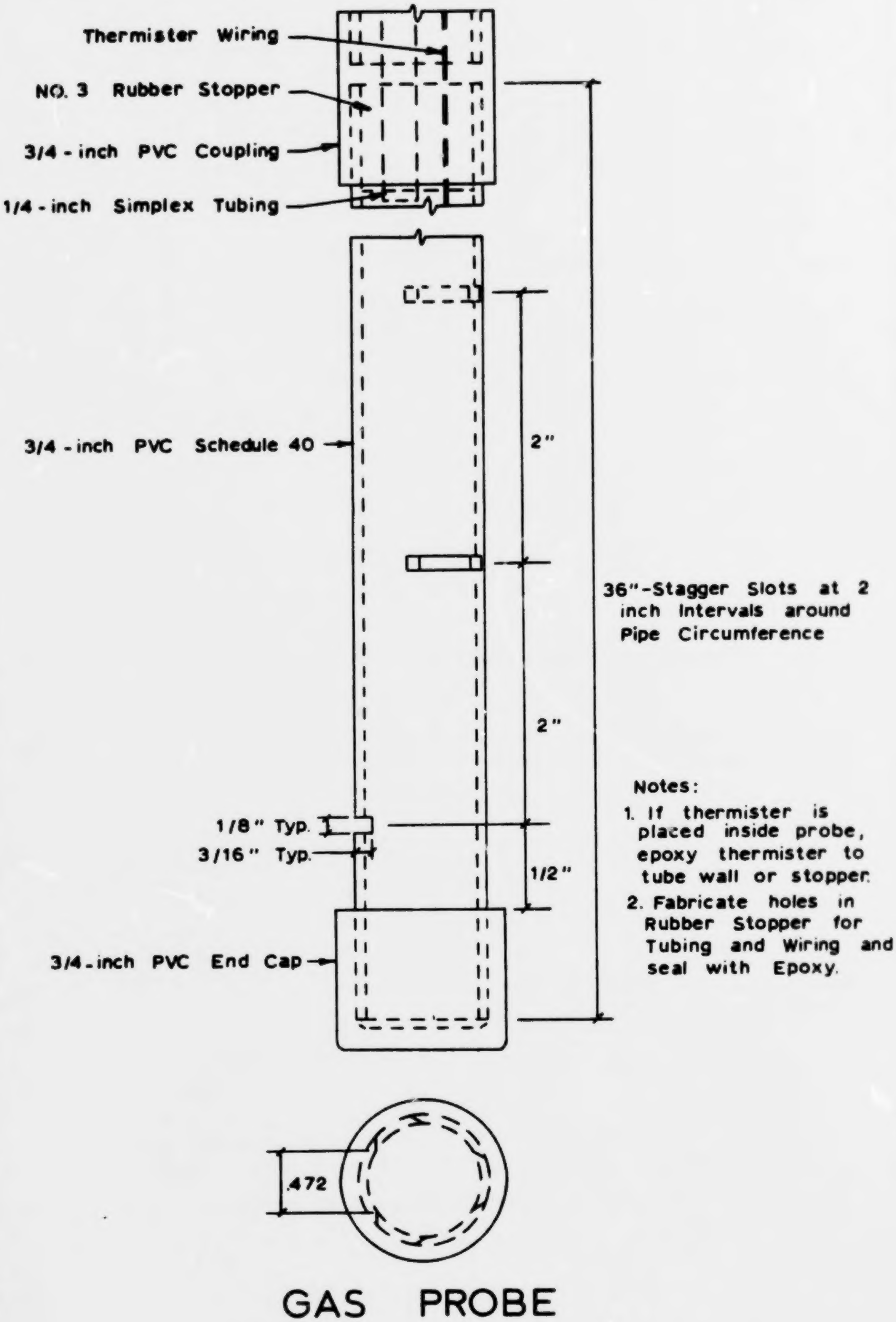
TEST DESIGNATION

MAXIMUM DRY DENSITY (pcf)

OPTIMUM MOISTURE CONTENT, %

APPENDIX D

INSTRUMENTATION DETAIL DRAWINGS

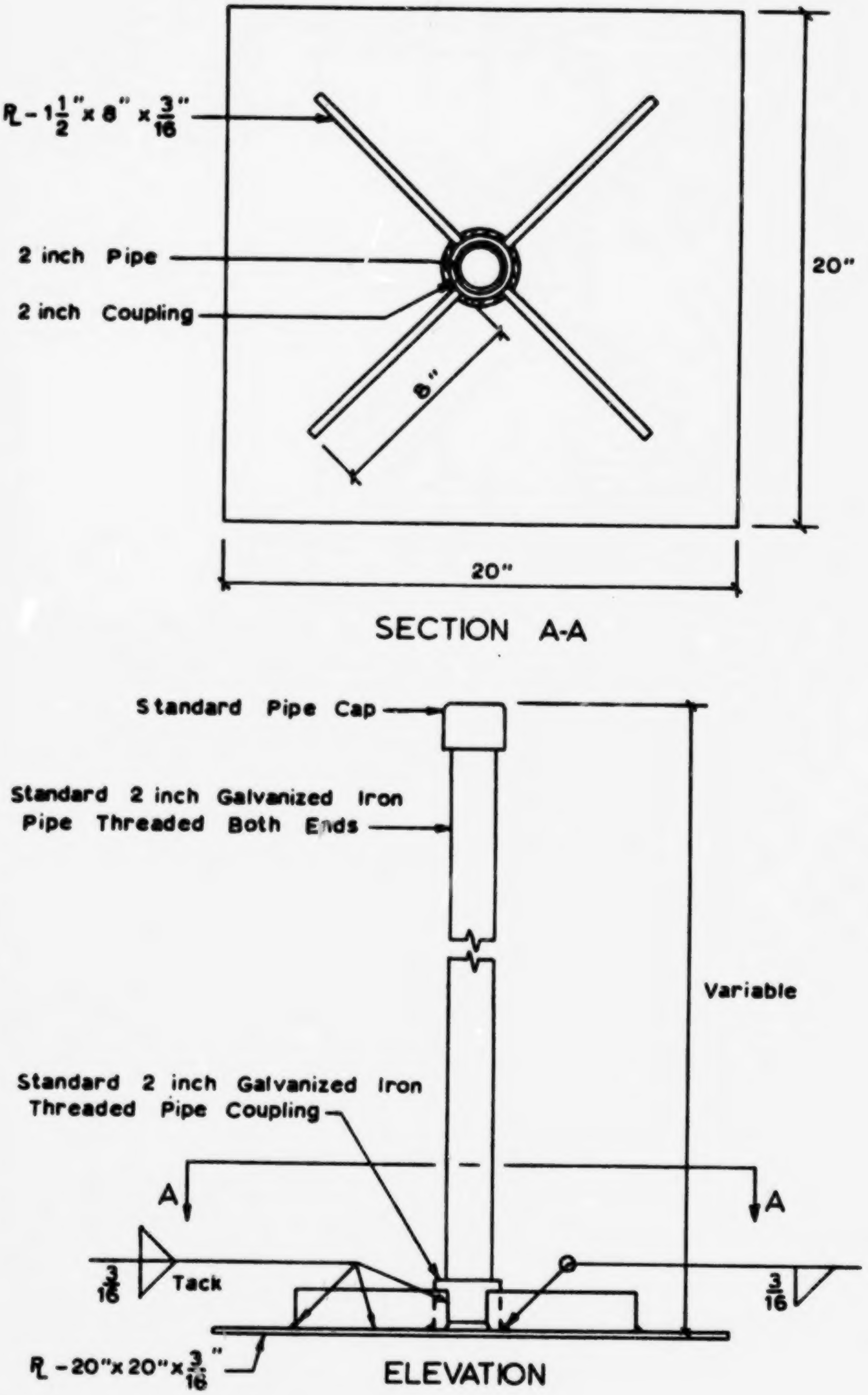

Thermister Wiring
NO. 3 Rubber Stopper
3/4 - inch PVC Coupling
1/4 - inch Simplex Tubing
3/4 - inch PVC Schedule 40
2"
36"-Stagger Slots at 2 inch Intervals around Pipe Circumference
2"
1/8" Typ.
3/16" Typ.
1/2"
3/4-inch PVC End Cap
.472

Notes:
1. If thermister is placed inside probe, epoxy thermister to tube wall or stopper.
2. Fabricate holes in Rubber Stopper for Tubing and Wiring and seal with Epoxy.

GAS PROBE

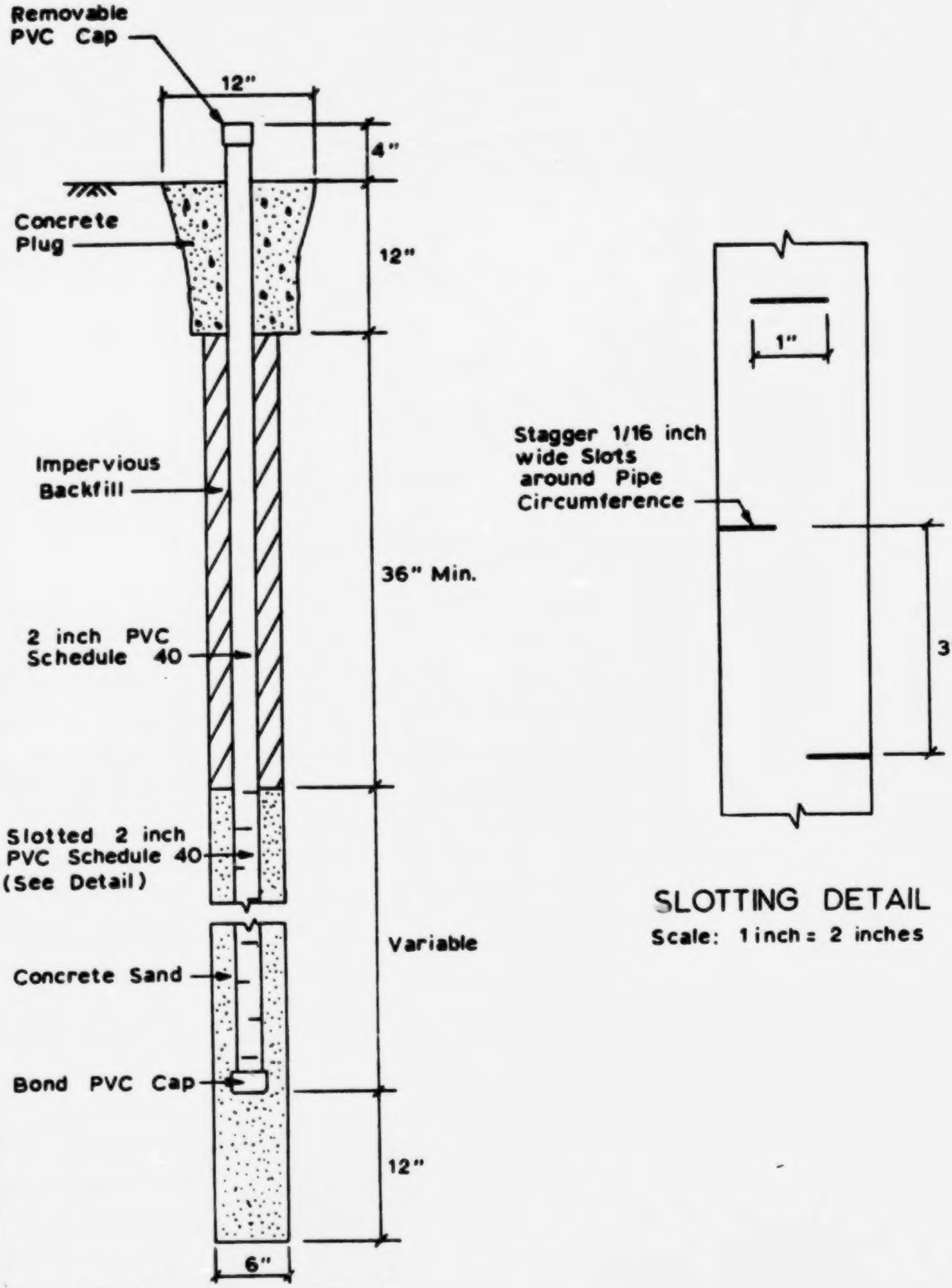
Full Scale

TI 1(8-71)


PL - 1 1/2" x 8" x 3/16"
2 inch Pipe
2 inch Coupling
8"
20"
20"
SECTION A-A
Standard Pipe Cap
Standard 2 inch Galvanized Iron Pipe Threaded Both Ends
Variable
Standard 2 inch Galvanized Iron Threaded Pipe Coupling
A
A
3/16 Tack
3/16
PL - 20" x 20" x 3/16"
ELEVATION

SETTLEMENT PLATE DETAIL

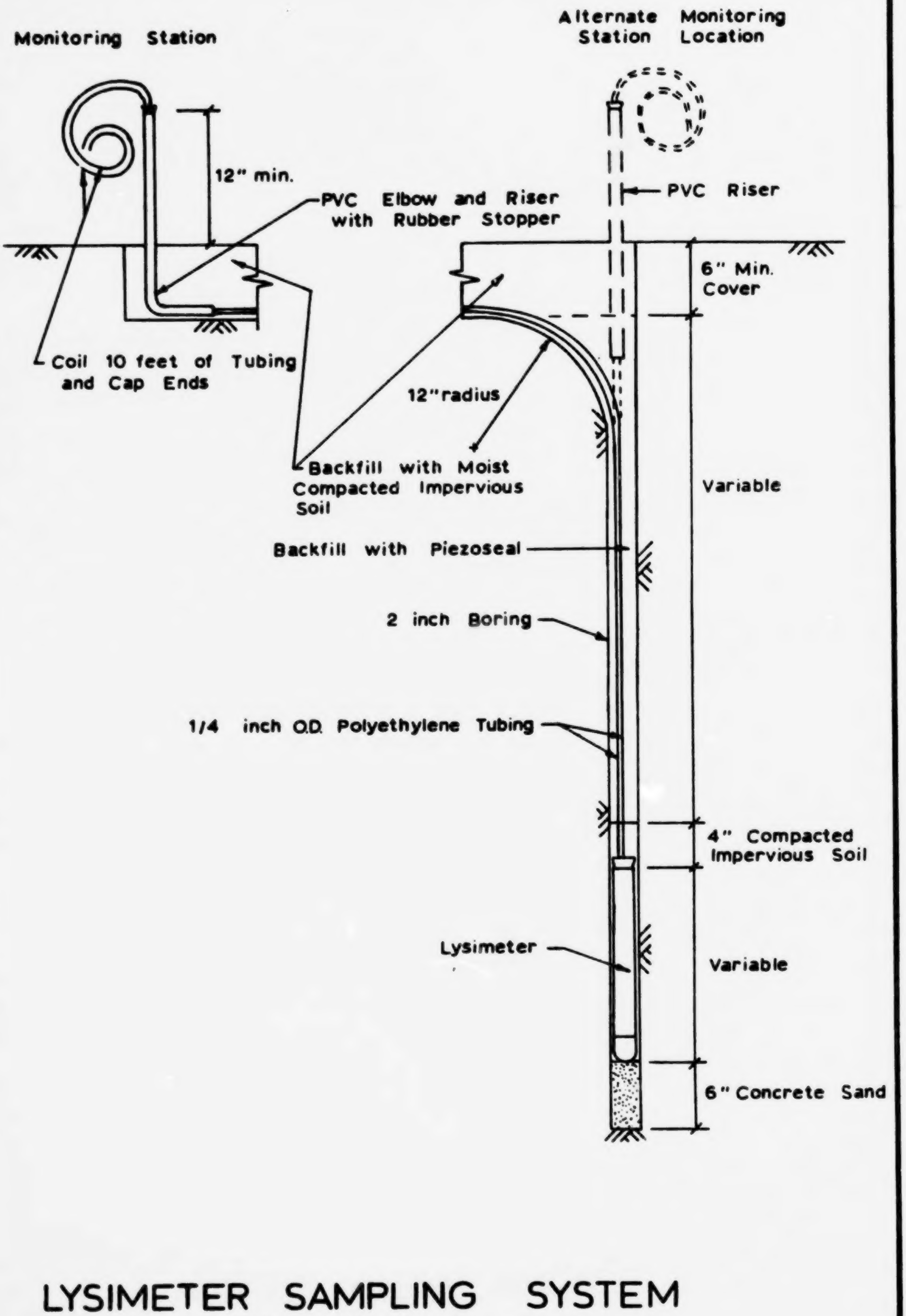
Scale: 1 inch = 6 inches


Removable PVC Cap
12"
4"
Concrete Plug
12"
Impervious Backfill
36" Min.
2 inch PVC Schedule 40
Slotted 2 inch PVC Schedule 40 (See Detail)
Variable
Concrete Sand
Bond PVC Cap
12"
6"
1"
Stagger 1/16 inch wide Slots around Pipe Circumference
3"

SLOTTING DETAIL
Scale: 1 inch = 2 inches

INSTALLATION DETAIL
Scale: 1 inch = 1 foot

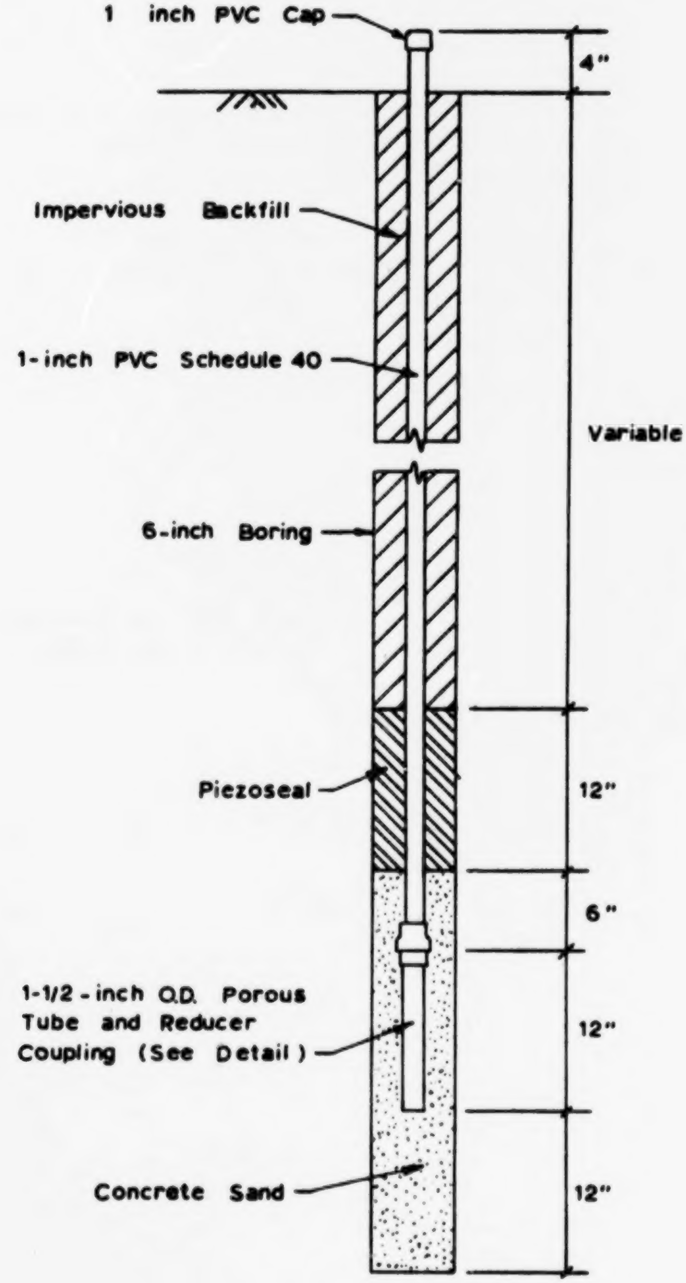
OBSERVATION WELL DETAIL


Monitoring Station
Alternate Monitoring Station Location
12" min.
PVC Elbow and Riser with Rubber Stopper
PVC Riser
6" Min. Cover
Coil 10 feet of Tubing and Cap Ends
12"radius
Backfill with Moist Compacted Impervious Soil
Variable
Backfill with Piezoseal
2 inch Boring
1/4 inch O.D. Polyethylene Tubing
4" Compacted Impervious Soil
Lysimeter
Variable
6" Concrete Sand

LYSIMETER SAMPLING SYSTEM

Scale: 1 inch = 1 foot

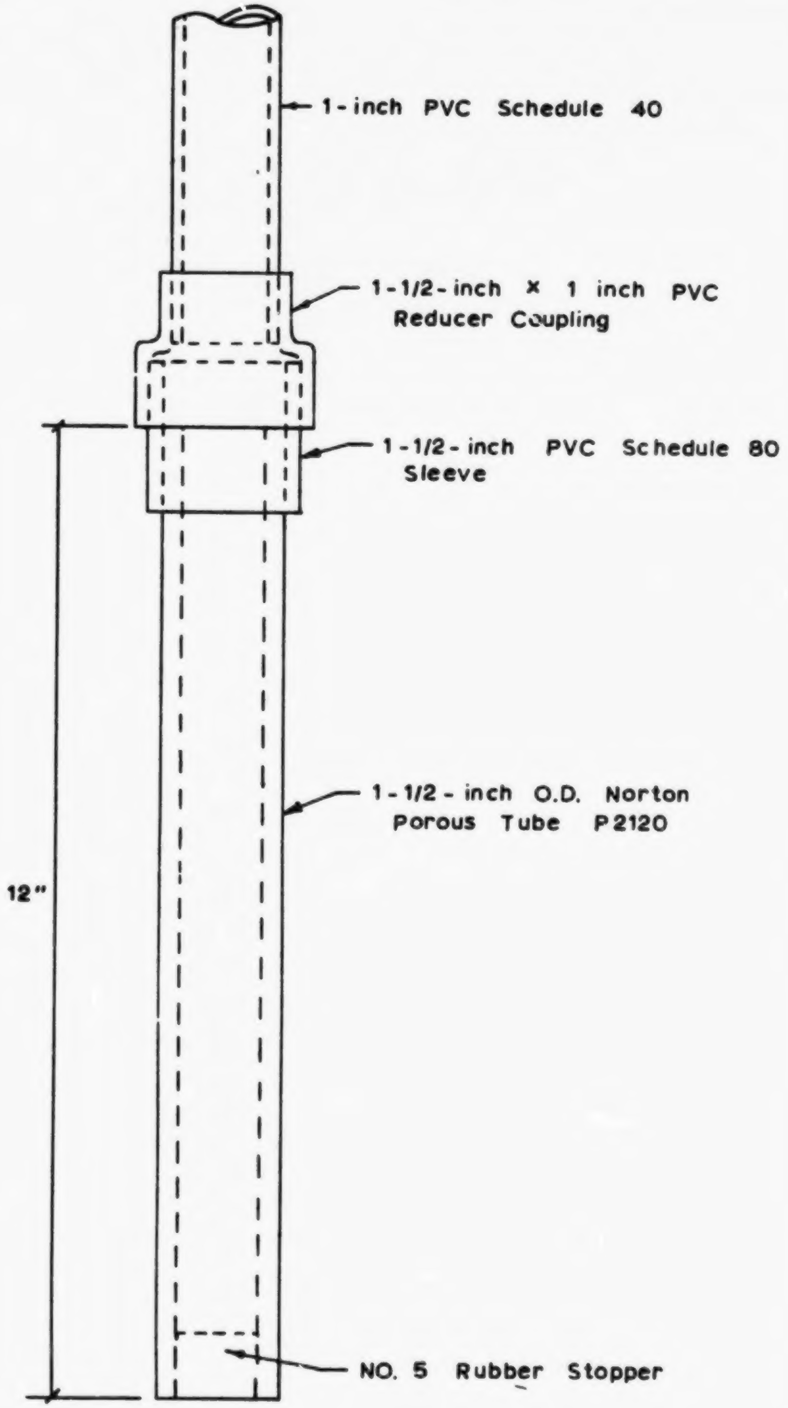
TI 1(8-71)


1 inch PVC Cap
4"
Impervious Backfill
1-inch PVC Schedule 40
Variable
6-inch Boring
Piezoseal
12"
6"
1-1/2-inch O.D. Porous Tube and Reducer Coupling (See Detail)
12"
Concrete Sand
12"

PIEZOMETER INSTALLATION DETAIL

Scale : 1 inch = 1 foot

TI 1(8-71)


1-inch PVC Schedule 40
1-1/2-inch × 1 inch PVC Reducer Coupling
1-1/2-inch PVC Schedule 80 Sleeve
1-1/2-inch O.D. Norton Porous Tube P2120
12"
NO. 5 Rubber Stopper

PIEZOMETER TIP DETAIL

Scale : 1 inch = 2 inches

TI 1(8-71)

APPENDIX E

REFUSE COMPOSITIONAL DATA

RANDOM SAMPLE ASSIGNMENT

CELL NO. A

Cumulative Weight Tons	Sample No.
21	A-21
55	A-55
92	A-92
160	A-160
168	A-168
180	A-180
189	A-189
224	A-224
238	A-238
255	A-255
359	A-359
457	A-457
480	A-480

CELL NO. B

Cumulative Weight Tons	Sample No.
11	B-11
14	B-14
78	B-78
125	B-125
178	B-178
186	B-186
187	B-187
255	B-255
265	B-265
336	B-336
365	B-365
370	B-370
439	B-439
495	B-495

CELL NO. C

Cumulative Weight Tons	Sample No.
56	C-56
118	C-118
142	C-142
159	C-159
176	C-176
178	C-178
254	C-254
261	C-261
262	C-262
394	C-394
420	C-420
472	C-472
496	C-496
499	C-499

CELL NO. D

Cumulative Weight Tons	Sample No.
10	D-10
55	D-55
63	D-63
145	D-145
168	D-168
211	D-211
252	D-252
358	D-358
359	D-359
420	D-420
436	D-436
438	D-438
456	D-456
493	D-493

CELL NO. E

Cumulative Weight Tons	Sample No.
80	E-80
86	E-86
87	E-87
105	E-105
157	E-157
250	E-250
259	E-259
276	E-276
295	E-295
338	E-338
362	E-362
407	E-407
432	E-432
495	E-495

NOTE: Random sample numbers (500 unit sample) obtained from:
Handbook of Tables for Mathematics, 4th Ed.
Chemical Rubber Co. 1970
18901 Cranwood Pkwy., Cleveland, Ohio 44128

REFUSE COMPOSITION DATA
CELL A

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
A21	%	7.7	3.5	22.9	5.1	1.0	0.9	6.8	11.7	16.0	24.4	100%
	wt.	23.6	10.6	70.3	15.8	3.0	2.9	21.0	36.0	49.2	75.0	307.4
A55	%	9.4	2.2	22.2	3.9	1.4	0.9	7.4	8.2	27.3	17.1	
	wt.	33.8	7.8	79.7	13.9	5.0	3.0	26.6	29.5	97.9	61.1	358.3
A92	%	10.7	5.1	41.8	6.1	0.5	0.9	8.8	8.4	2.1	15.6	
	wt.	38.9	18.7	152.1	22.3	1.7	3.4	31.9	30.6	7.8	56.8	364.2
A160	%	6.2	12.2	26.9	3.0	0.5	0.7	4.5	8.5	6.0	31.5	
	wt.	29.3	57.6	126.5	13.9	2.2	3.3	21.3	39.9	28.2	148.3	470.5
A168	%	8.8	33.4	18.6	2.9	0.8	0.1	8.2	5.1	4.5	17.6	
	wt.	50.2	191.4	106.7	16.5	4.7	0.5	47.0	29.0	26.0	101.0	573.1
A180	%	7.1	32.8	32.5	5.4	1.5	0.5	3.8	6.7	0.3	9.4	
	wt.	21.5	99.5	98.5	16.5	4.5	1.5	11.5	20.2	1.0	28.5	303.2
A189	%	15.4	0.1	41.9	4.5	1.8	7.2	10.2	9.4	0.6	8.9	
	wt.	50.1	0.1	136.2	14.7	5.9	23.5	33.0	30.6	1.8	29.0	324.9
A224	%	7.6	2.2	49.3	4.4	1.1	0.3	10.2	8.7	3.1	13.1	
	wt.	21.0	6.0	135.5	12.0	3.0	0.8	28.0	24.0	8.5	36.0	274.8
A238	%	10.5	6.8	32.0	4.0	2.4	0.6	6.5	12.3	2.9	22.0	
	wt.	42.0	27.0	128.0	16.0	9.5	2.5	26.0	49.5	11.5	88.0	400.0
A255	%	8.7	5.8	49.1	3.0	0.9	0.2	7.9	9.9	1.5	13.0	
	wt.	27.6	18.5	156.3	9.6	3.0	0.6	25.1	31.5	4.6	41.5	318.3
A359	%	12.1	11.4	38.1	4.5	1.1	1.7	14.9	10.3	0.5	5.4	
	wt.	39.4	37.1	124.1	14.5	3.5	5.5	48.6	33.6	1.6	17.5	325.4
A457	%	5.5	21.3	47.5	3.6	0.8	1.6	6.7	6.2	4.1	2.7	
	wt.	17.5	67.5	150.9	11.3	2.6	5.1	21.2	19.5	13.0	8.6	317.2
A480	%	4.6	3.3	38.3	4.1	0.9	1.1	7.6	13.3	6.9	19.9	
	wt.	16.4	11.6	135.9	14.6	3.0	3.8	27.0	46.9	24.3	70.5	354.0
	%											
	wt.											

* % is %of wet weight.

REFUSE COMPOSITION DATA
CELL B

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
B11	%	9.3	6.4	51.5	3.7	1.0	0.1	7.6	11.0	1.4	8.0	100%
	wt.	37.5	26.0	208.5	15.0	4.0	0.5	30.5	44.5	5.5	32.2	404.2
B14	%	12.4	15.4	40.6	5.1	1.1	1.5	12.0	7.3	2.5	2.1	
	wt.	55.3	68.5	180.5	22.5	5.0	6.5	53.5	32.5	11.0	9.5	444.8
B78	%	2.1	30.7	37.3	5.6	0.7	1.1	10.2	5.8	1.2	5.4	
	wt.	6.5	93.3	113.5	17.0	2.0	3.3	31.0	17.5	3.5	16.5	304.1
B125	%	7.6	34.5	36.9	2.7	0.5	2.7	7.0	7.6	0.0	0.5	
	wt.	23.5	107.0	114.5	8.4	1.5	8.5	21.7	23.5	0.0	1.5	310.1
B178	%	6.7	12.0	47.6	8.6	0.7	0.1	9.0	4.8	3.4	7.1	
	wt.	21.1	38.1	150.5	27.1	2.1	0.3	28.6	15.2	10.6	22.6	316.2
B186	%	10.8	10.7	42.1	5.6	0.9	1.7	11.1	8.7	0.6	7.7	
	wt.	44.5	44.0	173.4	23.2	3.8	7.1	45.5	36.0	2.5	31.5	411.5
B187	%	19.6	0.7	38.7	3.2	1.4	0.4	12.3	14.1	0.3	9.3	
	wt.	64.5	2.4	127.4	10.6	4.5	1.4	40.5	46.6	0.9	30.8	329.6
B255	%	19.9	0.7	48.4	3.8	1.3	1.9	10.5	9.3	0.9	3.3	
	wt.	75.5	2.5	183.1	14.5	4.9	7.4	39.6	35.1	3.5	12.5	378.6
B265	%	6.6	9.3	41.6	5.4	2.8	0.6	10.3	13.7	1.0	8.7	
	wt.	24.6	34.8	156.2	20.3	10.6	2.4	38.8	51.3	3.8	32.8	375.6
B336	%	7.8	23.0	43.6	3.8	3.1	0.2	8.5	8.3	0.0	1.7	
	wt.	28.0	82.2	156.1	13.6	11.2	0.8	30.4	29.6	0.1	6.1	358.1
B365	%	9.9	2.7	44.3	7.4	2.8	0.9	11.1	17.8	0.2	2.9	
	wt.	31.4	8.4	140.2	23.2	8.7	2.7	35.3	56.1	0.5	9.2	315.7
B370	%	13.2	9.7	37.4	5.9	0.8	1.3	9.5	16.5	0.0	5.7	
	wt.	43.6	32.2	124.0	19.6	2.5	4.3	31.6	54.5	0.0	19.0	331.3
B439	%	2.9	0.0	63.7	3.3	0.5	3.2	7.2	4.2	2.5	12.5	
	wt.	10.0	0.0	220.2	11.5	1.7	11.0	25.0	14.4	8.5	43.0	345.3
B495	%	16.7	0.0	49.6	8.5	2.1	0.2	11.8	8.9	0.7	1.5	
	wt.	48.1	0.0	143.2	24.5	6.0	0.7	34.1	25.6	2.0	4.4	288.6

* % is %of wet weight.

REFUSE COMPOSITION DATA
CELL C

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
C56	%	4.4	8.2	32.0	3.2	0.4	0.2	4.6	2.8	32.9	11.3	100%
	wt.	29.1	54.2	211.5	21.1	2.5	1.0	30.0	18.6	216.0	74.5	658.5
C118	%	11.4	3.8	37.4	3.7	4.7	0.2	8.7	11.3	1.3	17.5	
	wt.	43.0	14.5	141.2	13.8	17.7	0.6	33.0	49.7	4.9	66.1	377.5
C142	%	20.9	0.3	42.7	3.0	1.1	0.1	8.2	16.7	0.1	6.3	
	wt.	38.6	0.6	79.0	6.6	2.0	0.1	15.1	31.0	0.1	11.7	184.8
C159	%	11.9	25.5	28.9	4.0	2.7	2.0	4.5	12.1	2.8	5.6	
	wt.	40.5	86.6	98.0	13.6	9.1	6.9	15.3	40.7	9.5	19.0	339.2
C176	%	13.7	0.0	49.1	5.3	0.4	0.1	10.0	16.5	0.1	4.8	
	wt.	37.0	0.1	133.2	14.3	1.0	0.2	27.0	44.5	0.2	13.0	270.5
C178	%	10.2	0.7	50.2	7.3	7.7	0.5	9.6	9.8	0.0	4.0	
	wt.	32.0	2.3	157.3	22.9	24.0	1.6	30.1	30.7	0.0	12.6	313.5
C254	%	15.3	0.9	44.7	8.1	2.5	0.1	10.6	13.6	0.5	3.7	
	wt.	45.6	2.8	133.1	24.0	7.5	0.3	31.6	40.5	1.5	11.1	298.0
C261	%	18.8	2.8	30.2	5.9	5.4	2.1	11.1	14.8	2.5	6.4	
	wt.	82.5	12.0	132.3	25.7	23.8	9.1	48.5	64.8	11.0	28.2	437.9
C262	%	12.0	1.7	40.6	5.1	2.7	0.0	12.5	16.0	1.6	7.8	
	wt.	42.6	6.1	143.7	18.1	9.5	0.1	44.0	56.8	5.8	27.5	354.2
C394	%	13.7	6.7	46.6	4.3	2.1	0.0	8.4	8.6	2.1	7.5	
	wt.	58.8	28.9	201.1	18.5	9.2	0.0	36.4	36.9	9.0	32.4	431.2
C420	%	13.4	11.2	39.0	6.4	2.5	1.0	9.0	10.6	2.7	4.7	
	wt.	38.9	32.8	113.8	18.6	7.4	3.0	26.4	30.8	6.4	13.8	291.9
C472	%	10.2	13.6	48.0	5.2	1.1	1.0	10.6	8.7	0.2	1.4	
	wt.	28.0	37.5	132.0	14.3	3.0	2.8	29.0	24.0	0.5	3.9	275.0
C496	%	10.0	3.8	55.5	4.1	1.0	0.3	8.0	9.3	0.6	7.4	
	wt.	40.0	15.1	221.8	16.5	4.0	1.0	32.0	37.2	2.2	29.5	399.3
C499	%	13.8	1.5	48.8	5.4	0.9	0.4	7.0	10.4	3.5	8.3	
	wt.	35.6	3.9	126.0	14.0	2.3	0.9	18.1	26.9	9.0	21.5	258.2

* % is %of wet weight.

REFUSE COMPOSITION DATA
CELL D

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
D10	%	8.4	7.8	58.5	4.2	0.8	1.1	7.7	10.2	0.4	0.9	100%
	wt.	25.1	23.4	174.3	12.4	2.5	3.2	23.1	30.4	1.3	2.6	298.3
D55	%	16.2	0.7	46.0	4.9	1.8	0.4	11.3	14.4	0.0	4.8	
	wt.	50.2	0.5	142.0	15.1	5.4	1.1	35.0	44.7	0.0	15.0	309.0
D63	%	12.7	11.7	37.5	3.8	1.4	0.6	10.1	11.9	1.1	9.2	
	wt.	54.7	49.9	160.6	16.4	5.8	2.5	43.3	51.1	4.8	39.5	428.6
D145	%	15.2	0.7	39.9	4.5	1.8	2.4	9.0	15.9	1.1	9.5	
	wt.	46.6	2.0	121.9	13.8	5.5	7.4	27.5	48.7	3.5	28.9	305.8
D168	%	11.2	5.8	46.3	7.4	1.3	1.0	8.7	11.6	2.1	4.6	
	wt.	40.6	21.0	167.9	26.8	4.7	3.6	31.6	42.1	7.6	16.7	362.6
D211	%	11.7	7.9	43.9	4.0	0.3	0.6	11.5	10.3	0.2	9.6	
	wt.	36.3	24.5	136.8	12.5	1.0	1.8	35.7	32.1	0.5	29.9	311.1
D252	%	10.3	14.3	45.8	3.6	0.7	0.3	8.2	10.8	1.1	4.9	
	wt.	30.7	42.6	136.2	10.8	2.0	0.8	24.5	32.3	3.2	14.6	297.7
D358 D359	%	6.1	3.7	44.9	6.0	1.3	1.4	8.2	13.5	2.7	12.2	
	wt.	43.0	25.8	315.8	42.0	9.4	9.8	58.0	95.0	19.3	86.0	704.1
D420	%	9.0	15.0	48.7	3.5	0.3	0.3	7.9	10.9	0.0	4.4	
	wt.	29.6	49.6	161.1	11.5	1.1	1.1	26.0	36.1	0.0	14.7	330.8
D436	%	7.7	0.0	46.7	5.4	4.2	1.3	10.6	13.0	0.0	11.1	
	wt.	24.6	0.0	148.9	17.1	13.2	4.1	33.6	41.4	0.0	35.4	318.3
D438	%	6.1	28.3	33.4	3.1	0.9	1.0	7.3	13.6	0.0	6.3	
	wt.	16.0	74.1	87.7	8.1	2.4	2.6	19.2	35.6	0.0	16.4	262.1
D456	%	8.9	2.3	54.7	6.9	2.5	1.0	9.6	10.1	0.7	3.3	
	wt.	36.7	9.5	226.7	28.4	10.4	4.3	40.0	41.8	3.1	13.7	414.6
D493	%	6.4	2.9	42.4	3.3	2.7	5.0	15.3	13.7	1.0	7.3	
	wt.	18.6	8.5	123.2	9.2	7.8	14.6	44.3	39.6	3.0	21.2	290.5
	%											
	wt.											

* % is %of wet weight.

REFUSE COMPOSITION DATA
CELL E

SAMPLE #		food waste	garden waste	paper	plastic rubber, etc.	textile	wood	metals	glass, ceramic	ash, rock, dirt	fines	TOTAL
E80	%	12.9	9.1	39.3	4.4	1.3	0.6	8.3	16.7	1.4	6.0	100%
	wt.	44.0	31.2	134.5	15.0	4.4	1.9	28.5	57.0	4.9	20.5	341.9
E86	%	10.4	4.5	39.7	3.4	1.0	0.0	6.4	12.2	2.6	19.8	
	wt.	40.9	17.5	155.3	13.4	3.9	0.1	25.0	48.0	10.1	77.5	391.7
E87	%	10.9	8.7	46.0	3.6	1.0	0.5	10.0	11.9	0.6	6.8	
	wt.	35.2	28.0	148.4	11.5	3.4	1.5	32.5	38.5	2.0	21.9	322.9
E105	%	5.0	46.6	16.5	1.8	0.2	0.0	3.1	8.0	6.4	12.4	
	wt.	21.9	203.0	71.6	8.0	1.0	0.1	13.5	35.0	28.0	54.1	436.2
E157	%	14.5	4.3	37.8	4.0	1.8	1.0	10.4	12.8	0.6	12.8	
	wt.	57.5	17.1	149.3	15.8	7.0	4.0	41.1	50.5	2.5	50.8	395.6
E250	%	11.8	3.4	39.8	4.4	1.3	0.2	7.9	9.7	13.0	8.5	
	wt.	39.4	11.1	132.7	14.5	4.4	0.5	26.2	32.1	43.2	28.2	331.8
E259	%	40.6	1.8	20.8	4.9	4.2	0.6	8.0	9.5	4.9	4.7	
	wt.	141.2	6.1	72.4	17.1	14.6	2.0	28.0	33.1	17.0	16.2	347.7
E276	%	10.5	26.5	33.4	3.7	2.4	0.4	11.8	10.7	0.6	0.0	
	wt.	35.6	90.2	113.5	12.5	8.2	1.2	40.0	36.4	2.2	0.0	339.8
E295	%	2.7	53.4	27.8	5.4	1.3	1.0	5.4	2.8	0.2	0.0	
	wt.	7.0	140.1	72.8	14.0	3.5	2.5	14.1	7.4	0.5	0.0	261.9
E338	%	6.8	42.3	28.2	3.4	1.6	0.3	7.4	9.2	0.8	0.0	
	wt.	23.5	147.0	98.1	11.8	5.6	1.0	25.7	32.0	2.9	0.0	347.6
E362	%	8.2	6.2	38.7	5.7	3.5	0.0	14.7	17.1	0.5	5.4	
	wt.	24.0	18.0	112.5	16.6	10.2	0.1	42.7	49.7	1.5	15.8	291.1
E407	%	12.7	1.9	40.7	4.4	1.1	0.0	11.2	18.3	0.6	9.1	
	wt.	39.7	6.0	127.4	13.8	3.5	0.1	35.1	57.3	2.0	28.4	313.3
E432	%	13.2	11.0	39.3	5.2	4.8	0.6	9.0	12.8	0.9	3.2	
	wt.	44.6	37.1	133.1	17.5	16.3	2.0	30.5	43.1	3.0	10.7	337.9
E495	%	8.2	19.3	45.5	1.9	0.8	0.0	6.6	8.8	6.1	2.8	
	wt.	32.7	77.2	181.2	7.6	3.1	0.1	26.4	33.7	24.5	11.1	397.6

* % is %of wet weight.

REFUSE MOISTURE CONTENT DATA - CELL A

sample no.	total wet wt.	total dry wt.	% moist
21	12.25	7.69	59.3
55	13.70	9.80	39.8
92	11.55	7.38	56.5
160	25.52	17.59	45.1
168	8.67	6.55	32.4
180	10.66	8.15	30.8
224	12.41	10.14	22.4
238			
255			
359			
457			
480			

* % are % of dry weight.

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples ,

NOTE - Composit Drying Samples were not taken for Cell A

composit sample 2	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

composit sample 3	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

REFUSE MOISTURE CONTENT DATA - CELL B

sample no.	total wet wt.	total dry wt.	% moist
11	13.45	9.89	36.0
14	7.61	6.14	23.9
78	7.41	5.19	42.8
125	4.94	4.04	22.3
178	6.59	5.11	29.0
186	5.93	3.94	50.1
187	6.27	3.88	61.6
255	6.60	4.29	53.9
265	5.39	4.19	28.6
336	4.81	2.93	64.2
365	5.90	4.87	21.2
370	7.00	3.98	75.9
439	5.64	5.03	12.1
495	10.88	7.96	36.7

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass, ceramic	ash, rock	fines
composit sample 1	total wet weight #	10.02	7.10	7.34	6.80	6.60	7.04	9.33	8.36	5.89	8.19
	total dry weight #	4.04	4.42	5.82	5.90	4.98	6.56	8.95	8.33	5.79	5.69
	%moisture	148.0	60.3	26.1	15.3	32.5	7.3	4.3	0.5	1.7	43.9

Composit of samples , B-11, B-14,B-78, B-125

composit sample 2	total wet weight #	13.88	10.44	11.86	8.93	8.88	7.25	11.14	11.56	8.54	11.54
	total dry weight #	5.22	6.47	8.78	6.92	6.61	6.45	10.28	11.47	7.45	8.00
	%moisture	165.9	61.4	35.1	29.1	34.3	12.4	8.4	0.8	14.6	14.3

Composit of samples, B-178, B-186, B-187, B-255, B-265

composit sample 3	total wet weight #	10.92	6.84	9.98	8.53	9.48	7.67	9.86	11.73	5.03	10.87
	total dry weight #	4.58	3.79	8.00	7.22	6.49	6.40	9.28	11.62	4.38	7.14
	%moisture	138.4	80.5	24.8	18.1	46.1	19.8	6.3	1.0	14.8	52.2

Composit of samples, B-336, B=365, B-370, B-439, B-495

*** % are % of dry weight.**

REFUSE MOISTURE CONTENT - CELL C

sample no.	total wet wt.	total dry wt.	% moist
56	6.63	4.63	43.2
118	8.75	5.59	56.5
142	7.63	6.44	18.5
159	5.05	3.92	28.8
176	6.46	4.94	30.8
178	11.73	5.32	120.5
254	8.31	6.78	22.6
261	6.48	5.89	10.0
262	6.28	4.69	33.9
394	11.73	8.10	44.8
420	7.90	5.31	48.8
472	5.69	4.84	17.6
496	6.20	5.23	18.6
499	4.98	3.55	40.3

* % are % of dry weight.

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass ceramic	ash, rock	fines
composit sample 1	total wet weight #	13.82	9.65	13.79	7.80	10.65	5.08	12.00	13.73	15.48	11.77
	total dry weight #	6.01	4.70	10.34	6.17	7.86	4.13	11.22	13.65	12.30	8.46
	%moisture	130.0	105.3	33.4	26.4	35.5	23.0	7.0	0.6	25.9	39.1

Composit of samples , C-56, C-118, C-142, C-159, C-176, C-178

composit sample 2	total wet weight #	18.60	17.25	16.46	10.36	14.42	6.35	16.34	16.80	15.48	16.54
	total dry weight #	7.88	8.98	13.34	9.15	11.91	5.72	15.38	16.65	12.30	10.65
	%moisture	136.0	92.1	23.4	13.2	21.1	11.0	6.2	0.9	25.9	55.3

Composit of samples, C-254, C-261, C-262, C-394, C-420, C-472, C-496, C-499.

composit sample 3	total wet weight #										
	total dry weight #										
	%moisture										

Composit of samples,

REFUSE MOISTURE CONTENT - CELL D

sample no.	total wet wt.	total dry wt.	% moist
10	6.93	5.47	26.7
55	4.06	2.94	38.1
63	5.42	4.26	27.2
145	5.76	4.94	16.6
168	7.28	5.90	23.4
211	8.36	4.82	73.4
252	6.70	5.29	26.7
358	17.01	12.44	36.7
359	17.01	12.44	36.7
420	6.80	5.77	17.9
438	9.51	8.28	14.9
436	8.59	6.59	30.4
456	8.97	6.90	30.0
493	DATA LOST		

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass, ceramic	ash, rock	fines
composit sample 1	total wet weight #	11.12	8.28	9.24	6.71	10.45	9.20	12.42	13.28	7.36	12.22
	total dry weight #	4.79	4.35	7.36	5.73	8.22	7.19	11.76	13.18	6.37	8.22
	%moisture	132.2	90.3	25.5	17.1	27.1	27.96	5.6	0.8	15.5	48.7

Composit of samples ,D-10, D-55, D-63, D-145, D-168, D-211

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass, ceramic	ash, rock	fines
composit sample 2	total wet weight #	4.97	9.16	11.73	5.58	6.73	6.99	9.44	12.18	2.96	9.55
	total dry weight #	2.71	4.04	9.41	4.97	5.64	5.85	9.01	12.14	2.50	6.38
	%moisture	83.4	126.7	24.6	12.3	19.3	19.5	4.8	0.3	18.4	49.7

Composit of samples,D-252, D-358, D-359, D-420, D-438

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass, ceramic	ash, rock	fines
composit sample 3	total wet weight #	8.31	2.61	5.21	4.48	4.59	4.86	6.70	7.05	5.32	5.67
	total dry weight #	3.49	1.39	3.18	3.87	3.34	4.13	6.61	7.03	4.74	3.94
	%moisture	138.1	87.8	63.8	15.8	37.4	17.7	1.4	0.3	12.2	43.9

Composit of samples, D-436, D-456, D-493

*** % are % of dry weight.**

REFUSE MOISTURE CONTENT DATA - CELL E

sample no.	total wet wt.	total dry wt.	% moist
80	8.38	7.21	16.2
86	9.84	8.10	21.5
87	9.95	8.55	16.4
105	6.67	6.15	8.5
157	10.54	7.62	38.3
250	3.39	2.05	65.4
259	7.00	4.50	55.6
276	6.53	4.59	42.3
295	2.52	2.02	24.8
338	4.52	3.44	31.4
362	5.15	4.35	18.4
407	4.48	3.27	37.0
432	6.41	5.34	20.0
495	8.56	5.09	68.2

* % are % of dry weight.

		food waste	garden waste	paper	plastic rubber	textile	wood	metal	glass, ceramic	ash, rock	fines
composit sample 1	total wet weight #	11.52	10.30	11.11	8.95	8.74	4.87	10.37	13.28	9.15	13.03
	total dry weight #	4.83	5.78	7.94	7.75	7.50	4.36	10.16	13.21	8.59	9.82
	%moisture	138.5	78.2	39.9	15.5	16.5	11.7	2.1	0.5	6.5	32.7

Composit of samples , E-80, E-86, E-87, E-105, E-157

composit sample 2	total wet weight #	15.09	14.20	14.34	9.21	13.47	5.03	12.41	14.40	11.43	8.34
	total dry weight #	7.50	7.75	11.49	7.47	10.09	4.23	12.08	14.17	10.53	5.61
	%moisture	101.2	83.2	24.8	23.3	33.5	18.9	2.7	1.6	8.6	48.7

Composit of samples, E-250, E-259, E-276, E-295, E-338, E-362, E-407

composit sample 3	total wet weight #	7.54	4.69	4.37	4.28	INVALID	2.60	3.86	4.52	5.71	4.18
	total dry weight #	3.32	2.21	3.28	3.50		2.13	3.63	4.49	4.60	2.42
	%moisture	127.1	112.2	33.2	22.3		22.1	6.3	0.7	24.1	72.7

Composit of samples, E-432, E-495

APPENDIX F

MONITORING SCHEDULES

SUMMARY SAMPLING SCHEDULE

Initial Frquency of Analysis for Various Parameters

	Initial Frequency	
Parameter	Leachate	Groundwater
K	*	*
Na	*	*
Ca	semi-monthly**	monthly**
Mg	semi-monthly**	monthly**
Hg	*	*
Pb	*	*
Zn	*	*
Cu	*	*
Cd	*	*
Cl	semi-monthly**	semi-monthly**
PCB	*	*
pH	semi-monthly	semi-monthly
Alkalinity	semi-monthly	semi-monthly
COD	semi-monthly	monthly**
BOD	semi-monthly	monthly**
TDS	semi-monthly	semi-monthly
TSS	semi-monthly	none
Settleable Solids	semi-monthly	none
Nitrogen		
Ammonia	semi-monthly	monthly**
Organic - N	semi-monthly	none
Nitrate - N	semi-monthly	monthly**

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Parameter	Leachate	Groundwater
Total Phosphate	semi-monthly	none
DO	semi-monthly	none
Color	semi-monthly	none
Volatile Acids	monthly***	none
Fecal Coliform	semi-monthly**	monthly**
Fecal Streptococci	semi-monthly**	none

---

* Baseline data to be collected monthly at least for the first six months. The frequency of analysis will then be reevaluated on the basis of the available data.

** Frequency of analysis may change as the data are reviewed.

*** Baseline date to be collected at least the first 4 months within subsequent analysis depending on development of pH, alkalinity and BOD data.

SUMMARY SAMPLING SCHEDULE

Frequency of Gas Analysis

Commencing February 15, 1972

Cell Location	Sampling Frequency
Cell A - Bottom	Quarterly
A - Middle	Monthly
A - Top	Quarterly
Cell B - Bottom	Quarterly
B - Middle	Monthly
B - Top	Quarterly
Cell C - Bottom	Quarterly
C - Middle	Monthly
C - Top	Quartly
Cell D - Bottom	*
D - Middle	*
D - Top	Monthly
Cell E - Bottom	Quarterly
E - Middle	Monthly
E - Top	Quarterly

---

* No gas samples can be withdrawn from these probes due to fluid interference. Attempts in January 1972 to remove fluids encountered in these probes were unsuccessful. Attempts will be made periodically to withdraw samples.

SUMMARY SAMPLING SCHEDULE

Frequency of Analysis for Various Parameters
Commencing February 15, 1972

Parameter	Leachate		Groundwater
	Cells A, B & E	Cells C & D	Wells 1 thru 4 A & E Subdrain Water Supply Cell C
K	6-week intervals	monthly	quarterly
Na	6-week intervals	monthly	quarterly
Ca	6-week intervals	semi-monthly	quarterly
Mg	6-week intervals	semi-monthly	quarterly
Hg	6-week intervals	monthly	quarterly
Pb	6-week intervals	monthly	quarterly
Zn	6-week intervals	monthly	quarterly
Cu	6-week intervals	monthly	quarterly
Cl	6-week intervals	semi-monthly	quarterly
PCB	------	quarterly	semi-annually
pH	6-week intervals	semi-monthly	monthly
Alkalinity	6-week intervals	semi-monthly	quarterly
COD	6-week intervals	semi-monthly	quarterly
BOD	6-week intervals	semi-monthly	semi-annually
TDS	6-week intervals	semi-monthly	quarterly
TSS	6-week intervals	semi-monthly	quarterly
Settleable Solids	-----	quarterly	
Nitrogen			
Ammonia	6-week intervals	semi-monthly	semi-annually
Organic N	6-week intervals	semi-monthly	----
Nitrate N	6-week intervals	semi-monthly	semi-annually
Sulphate	quarterly	quarterly	quarterly
Tot. Phosphate	6-week intervals	semi-monthly	----
DO	6-week intervals	semi-monthly	monthly
Color	6-week intervals	semi-monthly	----
Volatile Acids	6-week intervals	monthly	----
Fecal coliform	quarterly	quarterly	semi-annually
Elect. Conductivity	6-week intervals	semi-monthly	monthly
Fecal Streptococci	semi-annually	semi-annually	semi-annually

---

*Initial test of Cell A leachate will include all parameters listed in December 1971 schedule in addition to those listed above.

SAMPLING SCHEDULE

Frequency of Fluid Sampling & Analysis
Revised May, 1973

Parameter	Leachate Cells A, B & E	 Cells C & D	Groundwater Wells 1 thru 4* A & E Subdrain* Water Supply Cell C
Alkalinity	6-week intervals	3-week intervals	quarterly
B.O.D.	6-week intervals	3-week intervals	semi-annually
Cadmium	6-week intervals	6-week intervals	quarterly
Calcium	6-week intervals	3-week intervals	quarterly
C.O.D.	6-week intervals	3-week intervals	quarterly
Chloride	6-week intervals	3-week intervals	quarterly
Copper	6-week intervals	6-week intervals	quarterly
Dissolved Oxygen	6-week intervals	3-week intervals	6-week intervals
Electrical Conductivity	6-week intervals	3-week intervals	6-week intervals
Fecal Coliform	semi-annually	semi-annually	semi-annually
Fecal Streptococci	semi-annually	semi-annually	semi-annually
Iron	6-week intervals	6-week intervals	quarterly
Lead	6-week intervals	6-week intervals	quarterly
Magnesium	6-week intervals	3-week intervals	quarterly
Mercury	6-week intervals	6-week intervals	quarterly
Nitrogen-Ammonia	6-week intervals	3-week intervals	semi-annually
Nitrogen-Organic	6-week intervals	3-week intervals	----
Nitrogen-Nitrate	6-week intervals	3-week intervals	semi-annually
Phosphate-total, as P	6-week intervals	3-week intervals	----
P.C.B.	semi-annually	semi-annually	(only if detected in cells)
Potassium	6-week intervals	6-week intervals	quarterly
Sodium	6-week intervals	6-week intervals	quarterly
Solids-Total Dissolved	6-week intervals	3-week intervals	quarterly
Solids-Settleable	------	quarterly	----
Total Sulphide	quarterly	quarterly	----
Sulphate	quarterly	quarterly	quarterly
Volatile Acids	6-week intervals	6-week intervals	----
Zinc	6-week intervals	6-week intervals	quarterly
pH	6-week intervals	3-week intervals	6-week intervals

---

*D.O., E.C. & pH to be run quarterly on Well 4 and A & E Subdrain.

SAMPLING SCHEDULE

Frequency of Gas Sampling & Analysis

Revised May, 1973

Gas Probe Location	Sampling Frequency
Cell A - Middle	6-week intervals
Cell B - Middle	6-week intervals
Cell C - Bottom	6-week intervals
Cell D - Top	6-week intervals
Cell E - Middle	6-week intervals

APPENDIX G

ANALYTICAL METHODS AND PROCEDURES FOR CHEMICAL ANALYSIS OF LEACHATE, GROUNDWATER AND GAS SAMPLES FROM SONOMA COUNTY CENTRAL DISPOSAL SITE SANITARY LANDFILL TEST CELLS

December 1971
Revised February 1972
Revised June 1972
Revised June 1973

TABLE OF CONTENTS

	Page
GENERAL	133
SAMPLING PROCEDURES AND PREANALYTICAL PREPARATION	133
Sampling Procedures	133
Sample Procurement	134
Sample Preservation	134
ANALYTICAL METHODS AND PROCEDURES	135
Detection Limits	135
Alkalinity	136
Biochemical Oxygen Demand	136
Calcium and Magnesium	137
Chemical Oxygen Demand	137
Chloride	138
Color	138
Dissolved Oxygen	138
Electro-Conductivity	140
Fecal Coliform	141
Fecal Streptococci	142
Gas Analysis	142
Heavy Metals	143
Nitrogen	146
Ammonia	146
Organic Nitrogen	147
Nitrate Nitrogen	147
pH Measurement	150
Phosphate (total)	152
Polychlorinated Biphenyls	152
Sodium and Potassium	155
Sulphate	155
Settleable Solids	156
Total Dissolved Solids	156
Total Suspended Solids	156
Volatile Acids	156
BIBLIOGRAPHY	157

GENERAL

Unless specifically noted, each analytical method is used to determine the specific constituent in all aqueous samples involved in this investigation. The taking, handling, and preservation of samples prior to analysis will vary according to the nature of the sample and constituent to be measured. Preanalytical preparations may require acidification, dilution, addition of a preservative, or filtration, to name some possibilities.

The samples handled in this research project include a broad range of concentrations and sample conditions. The analytical problems encountered include predicting the proper dilution ratio when samples are too concentrated, estimating sample volumes when low concentration of a given constituent is expected, and changing analytical procedures or methods when interferences occur. It may sometimes be necessary to use several methods for the same species, shifting the method to suit the special sample conditions.

SAMPLING PROCEDURES AND PREANALYTICAL PREPARATION

Sampling Procedures

In all cases and at all times taking and handling samples should be done in a manner which reduces to a minimum the possibilities for contamination and at the same time reduces to a minimum the time between sampling and analysis. The importance of conducting analysis as soon after sampling has been completed cannot be overemphasized.

Since there will be a significant time interval (several hours) between sampling and analysis, the samples for certain time dependent tests must be preserved in some manner to assure that the error due to chemical and biological change is held to a minimum. The methods used in this investigation are generally accepted and widely used (1, 2).

Sample Procurement

Samples, with the exception of those obtained for bacteriological tests, are collected in all-glass bottles with caps having plastic or foil liners. The glass sample bottles are prepared for use by rinsing in warm dilute HCl followed by a rinse with tap water and several rinses in distilled water. When sufficient sample volume is available, the bottle is rinsed at least once with the sample fluid before filling the bottle to overflow capacity. The samples are then prepared according to specific preanalytical procedures described below.

Samples taken for bacteriological tests are collected in 125 ml plastic bottles with plastic caps. The bottles are prepared in the laboratory beforehand by washing and sterilization as described in Standard Methods* (pg. 403).

Sample Preservation

Depending upon the test series to be run, from one to four samples are taken from each source for chemical analysis. All samples are stored on ice or under refrigeration at or below 4°c until tested. A preservative, $HgCl_2$, in a concentration of 40 mg/l of sample is added to samples to be tested for the following components:

Alkalinity
Chemical Oxygen Demand
Calcium
Magnesium
Color
Ammonia-N
Organic-N
Nitrate-N
Phosphate
Sulphate
Total Dissolved Solids
Total Suspended Solids
Settleable Solids
Volatile Acids

---

* Hereinafter reference to Standard Methods indicates Reference 1.

DETECTION LIMITS

The detection limits listed below are the minimum detection limits valid for normal operating procedures in the laboratory. This list is provided as a guide for the evaluation of the analytical procedures.

Component	Detection Limit	Unit
Cd	0.05	mg/l
Cu	0.02	mg/l
Fe	0.1	mg/l
Hg	0.05	µg/l
K	0.1	mg/l
Mg	0.05	mg/l
Mn	0.1	mg/l
Na	0.05	mg/l
Pb	0.1	mg/l
Zn	0.01	mg/l
alkalinity	1	mg/l as $CaCO_3$
BOD	5	mg/l
Ca	1	mg/l
COD	1	mg/l
Color	4	color units
Cl	1	mg/l
Dissolved O_2	0.1	mg/l
Nitrogen - NH_3	0.5	mg/l as N
Nitrogen - Organic	0.5	mg/l as N
Phosphate (as P)	0.5	mg/l as P
Solids - TS	5	mg/l
Solids - TDS	5	mg/l
Solids - TSS	5	mg/l
Solids - Settleable	0.2	ml/l
SO_4	5	mg/l
Volatile acids	50	mg/l

Alkalinity

Alkalinity is determined by potentiometric titration using a pH of 4.2 as the end point. The general method described in Standard Methods (page 52) is used. A sample size of 50 or 100 ml is used, depending on the alkalinity of the sample. For samples of high alkalinity a 10 ml sample is diluted up to 50 or 100 ml and then titrated.

Biochemical Oxygen Demand (BOD)

The biochemical oxygen demand (BOD) determination is conducted according to the procedure given in Standard Methods (page 489). The direct pipeting or dilution method is selected for preparing BOD samples based upon the estimated ultimate 5-day BOD.

For samples containing unknown BOD strengths it is necessary to prepare a range of dilutions so that the actual value will be bracketed. Generally three dilutions are required to assure adequate coverage of range. If the BOD can be reasonably estimated, the range of dilutions can be narrowed somewhat, but it is usually best to take a conservative approach. The following table will aid in preparing dilutions:

ESTIMATED BOD DILUTIONS*

Sample Volume - ml (added to 300 ml bottle)	Range of BOD Expected mg/l
0.05	12,000 - 42,000
0.10	6,000 - 20,000
0.20	3,000 - 10,000
0.50	1,200 - 4,200
1.0	600 - 2,000
2.0	300 - 1,000
5.0	100 - 400
10.0	60 - 200
20.0	30 - 100
50.0	10 - 40
100.0	5 - 20
300.0	0 - 7

---

* Modified and shortened from Sawyer & McCarty, Chemistry for Sanitary Engineers, McGraw-Hill. 2nd ed., 1967. p 403.

Calcium and Magnesium

The concentrations of calcium and magnesium are determined by complexometric titration with EDTA. There is the strong possibility of interference from dissolved heavy metals (e.g., Cu, Zn, Ni, Fe, Pb). This interference is overcome by complexing the metals with cyanide.* Routine addition of sodium cyanide solution is utilized to prevent potential metallic interference. The procedure is described in Standard Methods (page 181). When sample volumes to not permit titration techniques, Atomic Absorption Spectrophotometry (AAS) should be used to conserve the sample volume for measurement of other parameters. The methods described in Standard Methods (page 211) and elsewhere[10] can be used. Where highly colored leachate samples are obtained it may be necessary to analyze Ca and Mg by AAS to avoid color interferences with the EDTA method.

Chemical Oxygen Demand (COD)

The dichromate reflux method, Standard Methods (page 495), has been selected for the chemical oxygen demand (COD) determination because it has advantages over other oxidants in oxidizability, applicability to a wide variety of samples, and ease of manipulation.

The test is performed with the following modifications:

1. Sample and reagent volumes used are 20 ml aliquot of sample, 10 ml of 0.5N $K_2Cr_2O_7$ and 30 ml of H_2SO_4 containing Ag_2SO_4.
2. The maximum COD concentration which can be determined using the 20 ml aliquot sample is 2000 mg/l; for COD concentrations greater then 2000 mg/l, smaller volumes of sample diluted up to 20 ml with distilled water should be used.

---

* **CAUTION:** Cyanide is a strong poison and great care should be exercised when handling.

3. The standard ferrous ammonium sulfate titrant should be approximately 0.10N in concentration. Frequent standardization is required.
4. When the data indicate a COD consistently below 500 mg/l, the normal procedure described in Standard Methods (page 495) is to be employed.

Chloride

Because of the interferences expected in leachate samples, the method used for chloride analysis is the Mercuric Nitrate procedure. It is expected that orthophosphate, sulfide, and sulfite ions will be in sufficient concentrations so as to interfere with the Argentometric titration technique. The procedure as outlined in Standard Methods (page 97) is used. The presence of sulfites interferes. If the presence is suspected, oxidize by treating 50 ml sample with 0.5 to 1.0 ml of 30 percent H_2O_2. This method is used for both leachate and groundwater samples.

Experience has indicated that potentiometric titration of Cl with a Ag/AgCl electrode system is the best procedure when color interference is too great to allow colorimetric determinations. Discussions of potentiometric titration techniques for Cl are readily available (12, 13). Both methods are used for chloride analysis depending on the color interference. The procedure in Standard Methods (pg 377) is used for potentiometric titration of Cl.

Color

Color is measured according to the Platinum-Cobalt method described in Standard Methods (page 160).

Dissolved Oxygen (DO)

Most leachate samples are highly colored and it is therefore not possible to use the Winkler Method of analysis. A field oxygen probe is used for in-situ measurement of oxygen in both leachate and groundwater samples.

Dissolved oxygen is measured in the field using a battery operated Yellow Springs Instrument Co., Model 51A Dissolved Oxygen Meter. The instrument is equipped with a combination temperature, oxygen probe. Temperature can be read to 0.3° C and dissolved oxygen can be read to 0.1 ppm.

Below is a detailed description for use by field personnel who will be making the in-situ DO measurements:

1. Calibration of DO meter.

   a. Check the probe to assure the membrane is not damaged. Should the membrane be damaged, it can be replaced following the procedures outlined under "Preparation for Operation" in the instruction manual.

   b. Connect the probe cables to the instrument. The oxygen-temperature probes have two connectors of different sizes so they cannot be incorrectly attached to the instrument.

   c. With the instrument OFF check mechanical zero of meter and adjust if necessary with the screwdriver adjustment in the lower center of the meter bezel. Perform the adjustment with the instrument in the position it will be used.

   d. Turn the selector switch to ZERO and adjust the meter to zero with ZERO adjustment knob.

   e. Turn the selector switch to FULL SCALE and adjust the meter to the full scale position (15 ppm on the meter). If the meter cannot be adjusted to full scale, replace the batteries.

   f. Set the selector switch to CALIB O_2 with the probe in an environment of 100 percent relative humidity. This can be accomplished by placing the probe in the storage container partially filled with water, taking care that the membrane is not immersed. Leave the probe in this position for a period of 5 minutes to polarize it before making further calibrations or measurements.

   g. With the CALIB knob, set the meter pointer to the mark for the local altitude.

2. Measurement of Sample DO Content.

   a. Calibrate DO meter as outlined in calibration procedures.

   b. Place the probe in the water sample at the measurement site. To induce a flow of water across the membrane, raise and lower the probe.

   c. Turn the selector switch to TEMP and read the temperature from the lower meter scale. Record temperature.

   d. Set the O_2 SOLUBILITY FACTOR dial to the observed temperature, taking care to use the appropriate salinity index (each section of the bar on the O_2 SOLUBILITY FACTOR dial represents 5,000 ppm chloride concentration.) Previous analytical data on chloride concentration should be used to estimate appropriate salinity index setting.

   e. Turn the switch to O_2 and read the dissolved oxygen value in ppm directly from the meter dial. Record dissolved oxygen value.

   f. To perform a series of measurements in a short time at about the same temperature (within 5° C of calibration temperature), re-calibration is not required and performance will not be degraded. To take readings, simply repeat steps b, c, d, and e.

Electro-Conductivity (EC)

Electro conductivity is measured in the field using a battery operated Beckman, Type RB3, Solu Bridge. The instrument is equipped with three conductivity probe cells which provide a measurement range of from 50 to 200,000 micromhos/cm.

Below is a detailed description for use by field personnel who will be making the in-situ E. C. measurements:

1. Check the battery by depressing the battery check switch and the ON-OFF button simultaneously. The needle of the battery check meter should deflect to the right (positive) and come to rest in the green zone.

2. Set the manual temperature compensator to the solution temperature as measured by a thermometer or the reading from the D.O. meter. Record the temperature of the sample.
3. Connect the two lead wires of the conductivity probe cell to the two instrument terminals. Either lead wire can be connected to either terminal.
4. Remove the protective end cap and immerse the conductivity probe cell in the solution to be tested to a point at least one-half inch above the cell air vent. Move the cell up and down in the solution once or twice to insure removal of air bubbles from within the cell.
5. While depressing the ON-OFF button, rotate the main scale knob until the meter needle is opposite zero on the scale. Release the button.
6. Read the scale value opposite the index mark on the main scale knob. Determine the electro-conductivity by applying the appropriate conductivity probe cell factor to the scale value. Record electro conductivity.
7. Results can be checked by using another conductivity probe cell. The probe that provides a reading nearest the middle range of the scale should be used.
8. Clean the probe before storing by rinsing with tap water several times. If this is not done, a film may build up on the probe.

Fecal Coliform

The multiple tube dilution technique is used for the Fecal Coliform Test. Lactose broth is used for the presumptive test. The confirmed test utilizes the boric acid lactose broth. Details are given in Standard Methods (page 669). Data are reported as Most Probable Number (MPN) per 100 ml with a 95% confidence limit.

Fecal Streptococci

The Multiple-Tube Technique is used for Fecal Streptococci analysis. The Membrane Filter Technique could be used equally well. The procedure used for the presumptive test, confirmed test, and for computing and recording the MPN per 100 ml of the samples is given in Standard Methods (page 689).

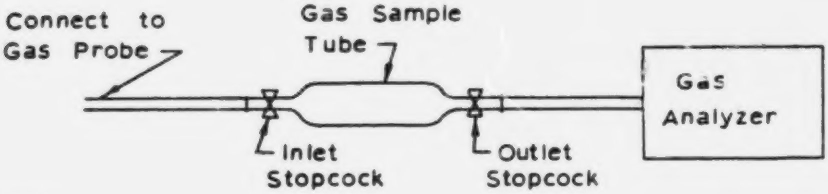
Gas Analysis

Gas samples from the landfill cells are collected in the field and are analyzed in the laboratory using a gas chromatograph system for gas-liquid partition chromatography. The gases analyzed for are CO_2, CH_4, N_2, H_2S, O_2.

Sampling Procedure: Gas samples are collected in the field in 250 ml glass gas sampling tubes. The principle is to draw the gas sample into and through the sample tube under a vacuum and to seal the container when a representative sample has been collected. Procedure for collection of gas samples is as follows:

1. Connect tubing from gas probe to gas sample tube inlet.
2. Connect the suction end of the field gas analyzer to gas sample tube outlet.
3. Open stopcocks on both ends of gas sampling tube.
4. Switch on field gas analyzer and draw sample through gas sample tube into gas analyzer until parts per million reading remains fairly constant, but for not less than one minute. (Pumping rate is approximately 1400 ml/min.)
5. Close sample tube outlet stopcock.
6. Close sample tube inlet stopcock.
7. Disconnect the gas sample tube outlet from the field gas analyzer.
8. Connect the hand vacuum pump to the gas sample tube outlet.
9. Open the stopcock at the outlet of the gas sample tube.
10. Pump with the hand vacuum pump for 20 repetitions (equal to approximately 26" of Mercury pressure) to evacuate the sample tube.

11. Close the stopcock at the outlet of the gas sample tube.
12. Reconnect and switch on the field gas analyzer.
13. Open the inlet stopcock, then the outlet stopcock of the gas sample tube.
14. Continue pumping for 30 seconds.
15. Close sample tube outlet stopcock.
16. Close sample tube inlet stopcock.
17. Disconnect gas sample tube from gas probe and field gas analyzer. Care should be taken not to disturb either stopcock while transporting and handling the gas sample tube. Record on the gas sample tube the container number, sampling location, and date.



Heavy Metals

All field samples require preanalytical treatment consisting of the addition of 5 ml 1:1 HNO_3 per liter of sample. The acid is placed in the collecting container prior to collection and the sample bottle is filled to the top and capped.

Analysis for five heavy metals (Hg, Pb, Zn, Cu, Cd) is done by Atomic Absorption Spectrophotometry. Pb, Zn, Cu, and Cd are run by the normal flame method as described in Standard Methods (page 417).

Mercury is analyzed for by the flameless atomic absorption technique similar to that prescribed by EPA Methods* (page 121). Additional information on this technique is available (6, 7). Details of the analytical procedure are presented below:

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* Hereinafter reference to EPA Methods indicates Reference 2.

Total Mercury Analysis

The following method for the determination of Mercury in solution employs a preanalytical acid oxidation procedure followed by a simple reduction aeration procedure to produce and introduce elemental mercury vapor into a flow-through system where the absorption at 253.7 nm is measured in a quartz-windowed cell. This method applies to both groundwater and leachate samples, although the sample volume may have to be increased for the groundwater samples.

The range of the method may be varied through instrument and/or recorder expansion. Using a 25 ml sample, a detection limit of 1.0 μg Hg/l can be maintained. Concentrations below this level should be reported as <1.0.

1. Acid Oxidation Procedure
   a. Place a sample aliquot of 25 ml in a 100 ml Erlenmeyer Flask. If necessary, a diluting solution is added to bring samples up to a convenient volume.
   b. Add 5 ml acid solution, 2 ml potassium persulfate solution and several drops of potassium permanganate solution. Cover or stopper the flasks and allow solutions to stand at least 24 hours at room temperature.
   c. Add several drops of potassium permanganate solution. Digestion is considered complete when the pink $KMnO_4$ color remains at least one hour. The sample is now ready for analysis.
2. Analytical Procedure
   a. Transfer the sample to the volitilization cell (see figure). Seal the volitilization cell.
   b. Add 10 ml of reducing solution by syringe. Several blanks are prepared by treating 25 ml aliquots of dilution water exactly like the samples.

3. Calibration

Each and every time samples are run, at least three standard mercury solutions (0.5, 1.0, 1.5 μg Hg) must be run to calibrate the system.

a. Add desired amount of standard mercury solution to the volatilization cell.

b. Add sufficient dilution water to give about 25 ml total volume.

c. Add 5 ml acid solution.

d. Seal the volatilization cell.

e. Add 5 ml of the reducing solution by syringe.

4. Calculation

a. Determine the peak height of the unknown from the strip chart and read the mercury value from the standard curve. The standard curve is prepared by plotting the peak height of standards versus the micrograms of Hg.

b. Calculate the mercury concentration in the sample by the following relationship:

$$\mu g\ Hg/l = \mu g\ Hg \text{ in Aliquot} \times \frac{1000}{\text{aliquot volume}}$$

5. Reagents

a. Acid Solution. 2:1 by volume ratio of concentrated sulfuric acid, H_2SO_4, and nitric acid, HNO_3.

b. Diluting Solution. Add 1 ml concentrated perchloric acid to one liter distilled water, and add a few $KMnO_4$ crystals to just give a faint pink color.

c. Potassium Permanganate Solution. 5% solution, w/v. Dissolve 5 gm $KMnO_4$ in 100 ml distilled water.

d. Potassium Persulfate Solution. 5% solution, w/v. Dissolve 5 gm $K_2S_2O_8$ in 100 ml distilled water.

e. Reducing Solution. To 2 liters of distilled water add 250 gm $SnCl_2$, 150 gm $NH_2OH \cdot HCl$, 150 gm NaCl, and 100 ml of concentrated H_2SO_4.

f. Stock Mercury Solution. Dissolve 0.1354 gm of mercuric chloride in 75 ml of distilled water. Add 10 ml of concentrated nitric acid and adjust the volume to 100 ml. 1 ml = 1 mg Hg

g. Standard Mercury Solution. Make the appropriate dilutions of the stock mercury solution to obtain a working standard containing 0.1 μg per ml. This working standard and the dilutions must be prepared fresh daily. The acidity of the working standard should be kept at about 0.15% nitric acid. This acid should be added to the flask as needed before the addition of the aliquot.

6. Apparatus

a. Atomic Absorption Spectrophotometer. Any atomic absorption unit which is capable of accommodating the cold vapor cell. Instrument settings recommended by the manufacturer should be followed.

b. Hg Hollow Cathode Lamp.

c. Recorder. Any multi-range variable speed strip chart recorder compatible with the Uv detection system in use.

d. Cold Vapor Absorption Cell. Suitable cells may be constructed from standard spectrophotometric 10 cm cells having quartz end windows or may be constructed from plexiglass tubing making sure to use quartz end windows that are perpendicular to the line of light. See Reference 1, 6, or 7 for exact details.

Nitrogen

Ammonia. The preliminary distillation method is used for ammonia as described in Standard Methods (page 229). The distillation method covers the determination of ammonia-nitrogen exclusive of total Kjeldahl nitrogen. This method covers the range from about 1.0 to 25 mg/l when the titrometric end point is used. Since most leachate samples will contain NH_3-N in the range 100-600 mg/l, it will be necessary to use small sample volumes (20-400 ml) and dilute with ammonia-free distilled water up to 500 ml.

Organic Nitrogen. Organic Kjeldahl nitrogen is defined as the nitrogen converted to ammonia from nitrogen components of biological origin such as amino acids, proteins and peptides, but may not include the nitrogenous compounds such as amines, nitro compounds, hydrazones, oximes, semicarbazones and refractory tertiary amines. Organic Kjeldahl nitrogen is determined after distillation of free ammonia from the sample. The method used is described in the EPA Methods (page 149) and is similar except for minor details to the procedure detailed in Standard Methods (page 244).

Nitrate Nitrogen. The Brucine Method employed for the measurement of nitrate nitrogen is described in EPA Methods (page 170). This method is based upon the reaction of the nitrate ion with brucine sulfate* in a 13N H_2SO_4 solution at a temperature of 100° C. The color of the resulting complex is measured at 410 nm. Temperature control of the color reaction is extremely critical. Details of the analytical procedure are presented below:

Brucine Method

This method is applicable to the analysis in both groundwater and leachate samples. Modification can be made to remove or correct for turbidity, color, salinity, or dissolved organic compounds in samples. The range of the method is 0.1 to 2 mg/l NO_3-N.

Samples may be preserved for several days by the addition of 40 mg/l $HgCl_2$ and storage at $4^\circ C$. Analysis should not be delayed more than a week.

1. Points to Note.
   a. Dissolved organic matter will cause an off color in $13NH_2SO_4$ and must be compensated for by additions of all reagents except the brucine-sulfanilic acid reagent. This also applies to natural color present not due to dissolved organics.
   b. The effect of salinity is eliminated by addition of sodium chloride to the blanks, standards, and samples.

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* Brucine Sulfate is toxic; reagent bottle should be marked with warning.

c. Ferrous and ferric iron and quadrivalent manganese give slight positive interference. In concentrations less than 1 mg/l these are negligible.

d. All strong oxidizing or reducing agents interfere. The presence of oxidizing agents may be determined by the addition of orthotolidine reagent.

e. Uneven heating of the samples and standards during the reaction time will result in erratic values. The necessity for absolute control of temperature during the critical color development period cannot be too strongly emphasized.

2. Analytical Procedure

a. Adjust the pH of the samples to approximately pH 7 with 1:3 acedic acid and, if necessary, filter through a 0.54 μ pore size filter.

b. Set up the required number of matches tubes in the rack to handle reagent blank, standards and samples. It is suggested that tubes be spaced evenly throughout the rack to allow for even flow of bath water between the tubes. Even spacing of tubes should assist in achieving uniform heating of all tubes.

c. If it is necessary to correct for color or dissolved organic matter which will cause color on heating, a set of duplicate tubes must be used to which all reagents except the brucine-sulfanilic acid has been added.

d. Pipette 10.0 ml or an aliquot of the samples diluted to 10.0 ml into the sample tubes.

e. If the samples have high dissolved solids, add 2 ml of the 30 percent sodium chloride solution to the reagent blank, standards, and samples. For groundwater samples, sodium chloride solution may be omitted. Mix contents of tubes by swirling and place rack in cold water bath (0-10°C).

f. Pipette 10.0 ml of sulfuric acid solution into each tube and mix by swirling. Allow tubes to come to thermal equilibrium in the cold bath. Be sure that temperatures have equilibrated in all tubes before continuing.

g. Add 0.5 ml brucine-sulfanilic acid reagent to each tube (except the interference control tubes) and carefully mix by swirling, then place the rack of tubes in the boiling water bath for exactly 25 minutes.

CAUTION: Immersion of the tube rack into the bath should not decrease the temperature of the bath more than 1° to 2° C. Flow of bath water between the tubes should not be restricted by crowding too many tubes into the rack, in order to keep this temperature decrease to an absolute minimum. If color development in the standards reveals discrepancies in the procedure, the operator should repeat the procedure after reviewing the temperature control steps.

h. Remove rack of tubes from the hot water bath and immerse in the cold water bath and allow to reach thermal equilibrium (20-25° C.).

i. Dry tubes and read absorbance against the reagent blank at 410 nm.

3. Calculation

a. Obtain a standard curve by plotting the absorbance of standards run by the above procedure against mg NO_3-N. (The color reaction does not always follow Beer's law).

b. Subtract the absorbance of the sample without the brucine-sulfanilic reagent from the absorbance of the sample containing brucine-sulfanilic acid and read the absorbance in mg NO_3-N. Convert mg per aliquot of sample to mg per leter.

4. Reagents

a. Distilled water free of nitrite and nitrate is to be used in preparation of all reagents and standards.

b. Sodium chloride solution (300 g/l). Dissolve 300 g NcCl in distilled water and dilute to 1.0 l.

c. Sulfuric acid solution. Carefully add 500 ml H_2SO_4 (sp. gr. 1.84) to 125 ml distilled water. Cool and keep tightly stoppered to prevent absorption of atmospheric moisture.

d. Brucine-sulfanilic acid reagent. Dissolve 1 g brucine sulfate $\left[(C_{23}H_{26}N_2O_4)_2 \cdot H_2SO_4 \cdot 7H_2O\right]$ and 0.1 g sulfanilic acid ($NH_2C_6H_4SO_3H \cdot H_2O$) in 70 ml hot distilled water. Add 3 ml concentrated HCl, cool, mix and dilute to 100 ml. Store in a dark bottle at 5°C. This solution is stable for several months; the pink color that develope slowly does not effect its usefulness. Mark bottle with warning: CAUTION: Brucine Sulfate is toxic; take care to avoid ingestion.

e. Potassium nitrate stock solution (1 ml = 0.1 mg NO_3-N). Dissolve 0.7218 g anhydrous potassium nitrate (KNO_3) in distilled water and dilute to 1 liter.

f. Potassium nitrate standard solution (1 ml = 0.001 mg NO_3-N). Dilute 10.0 ml of the stock solution to 1 liter. This standard solution should be prepared fresh weekly.

g. Acetic acid (1+3). Dilute 1 vol. glacial acetic acid (CH_3COOH) with 3 volumes of distilled water.

5. Apparatus

a. Spectrophotometer or filter photometer suitable for measuring absorbance at 410 nm and capable of accommodating 25 mm diameter cells.

b. Sufficient number of 25 mm diameter matches tubes for reagent blanks, standards, and samples.

c. Neoprene coated wire racks to hold 25 mm diameter tubes.

d. Water bath suitable for use at 100°C. This bath should contain a stirring machanism so that all tubes are at same temperature and should be of sufficient capacity to accept the required number of tubes without significant drop in temperature when the tubes are immersed.

e. Water bath suitable for use at 10-15°C.

Measurement of pH

pH is measured in the field using a battery operated Beckman Electromate pH Meter. The instrument is equipped with a combination electrode and normal operating procedures will assure a precision of ± 0.1 pH unit.

The following is a detailed description of test procedures for use by field personnel who will be making the in-situ pH measurements. It is important that explicit care be taken to assure as great an accuracy and precision as can be maintained since field measurements are unduly subject to possible error.

1. Calibration of pH meter and electrode.
    a. Check the battery power supply to assure adequate power.
    b. Check to make sure that the pH meter is in the proper operating mode. Turn function switch to STANDBY, temperature compensation to the temperature of samples and buffers.
    c. Be sure that the samples and buffers are at the same temperature before calibrating instrument.
    d. Rinse off electrode with distilled water and dry gently with soft tissue paper.
    e. Place the combination electrode into the buffer solution pH 7. Turn function switch to pH and after several minutes adjust the meter reading to the pH of the buffer solution by using the "standardize" dial.
    f. Turn function switch to STANDBY. Remove combination electrode from buffer solution, rinse with distilled water, and dry.
    g. Repeat e. and f. for buffer of pH 4.
2. Measurement of Sample pH.
    a. Use of the combination electrode allows measurement of pH in small beakers. Use a clean 50 ml or 100 ml beaker. Insert the combination electrode in sample. The electrode must not touch the sides or bottom of the beaker. Turn function switch to pH. Slowly rotate the beaker several times to insure good contact of sample and electrode. When meter reading has stabilized, record pH.
    b. Turn function switch to STANDBY and remove electrode. Rinse electrode with distilled water and dry carefully with soft tissue.
    c. Repeat procedure for each sample.

3. Storage and care of combination electrode.

   a. The salt solution in the reference part of the electrode should be topped off occasionally to assure an adequate level is maintained.

   b. The rubber sleeve should be kept over the fill hole except when equilibrating pressure or filling with salt solution.

   c. The electrode should be stored in a manner that keeps the electrode tip wet at all times.

Phosphate - Total

Digestion of Raw Sample: The persulfate digestion method will be used to prepare samples for analysis of total phosphate. The method follows the description in Standard Methods (page 526). Additional information on this digestion method can be found elsewhere[8].

When necessary the sulfuric acid-nitric acid digestive method, Standard Methods (page 525), will be used in lieu of the above.

Analytical Method: The ascorbic acid-molybdate method described in Standard Methods (page 532) is applicable to the measurement of total phosphate in the leachate samples. Arsenates interfere with the analysis above 0.05 mg/l arsenic. This method for total phosphate is adequate for the full range of 0.03 to 2.0 mg/l as P.

When necessary the above specified analytical method will be replaced by the vanadomolybdo-phosphoric acid colorimetric method, Standard Methods (page 527).

Polychlorinated Biphenyls (PCB)

Since the chlorinated compounds are generally quite surface active, most of the PCB is expected to be on the suspended material. The suspended matter, after separation on a glass fiber disc, is extracted by agitation in 1:1 acetone:acetonitrite. Chlorinated pesticides are partitioned into petroleum ether after the addition of a weak salt solution. The extract is cleaned up on florisil before gas-liquid chromatography detection of the chlorinated materials.

This method is suitable for aqueous samples with or without large amounts of suspended matter. The detection limit is 10 nanograms per liter of sample. Therefore it is very important that extraordinary cleanliness be maintained to avoid contamination.

Analytical Method

Samples containing 1 gm/l or more suspended matter must be filtered (Section 1) and the filtrate and suspended matter analyzed separately as discussed in Section 3 (water) and Section 2 (sediment). Samples having less than 1 gm/l suspended material can be analyzed as a whole sample according to Section 3.

1. Filtration of Heavily Sedimented Samples

a. Place a 7 cm. Whatman GF/B filter pad (or equivalent) in a porcelain Buchner funnel and prewash with 50 ml distilled petroleum ether. Discard the washings.

b. Measure out 1 liter of homogeneous sample and filter using suction.

c. Transfer the filtrate to a 2 liter separatory funnel and proceed according to Section 3.

d. Transfer the filter pad to a 600 ml beaker with clean forceps and proceed according to Section 2.

2. Extraction Procedure for Sediment Fraction

a. Add 100 ml of 1:1 acetonitrile:acetone and 50 ml distilled water to beaker containing the filter pads. Allow contact for more than 2 hours with occasional stirring.

b. After 2 hours remove the sediment from the filter pad by masscerating the pad with two clean glass stirring rods.

c. Allow the sediment to settle and decant the clear supernatant using the stirring rods to hold back the glass filter fibers. Decant into 1000 ml of distilled water in a 2 liter separatory funnel.

d. Repeat the partitioning with two additional 50 ml portions of 1:1 acetonitrile:acetone, each time allowing the sample to soak for more than one hour with occasional swirling. Decant the clear supernatant into the separatory funnel. This should bring the total volume up to 200 ml of extractant.

e. Add 30 gm Na_2SO_4 and extract two times with 150 ml petroleum ether, each time washing the petroleum ether twice with 100 ml distilled water which is added to the rest of the aqueous sample. (This is done to wash acetonitrile and acetone out of the petroleum ether so they will not interfere with the florisil cleanup.) If heavy emulsion occurs at this point, as it may with dirty samples, include the emulsion with the aqueous phase each time and partition a third time with 150 ml petroleum ether.

f. Carry through with evaporation, florisil cleanup and detection as described in Section 3 for aqueous samples.

3. Extraction Procedure for Aqueous Fraction

a. Add 150 ml of redistilled 15% diethyl ether in petroleum ether to the sample. Shake vigorously for 3 minutes. Settle for at least 10 minutes.

b. Draw off and save the aqueous phase.

c. Swirl the organic phase to dislodge water from the sides of the funnel.

d. Draw the organic phase into a clean 600 ml beaker.

e. Return the aqueous phase to the separatory funnel and repeat steps a-d with another 150 ml 15% ethyl ether in petroleum ether.

f. Repeat steps a-d with 150 ml petroleum ether (no ethyl ether).

g. Prepare a large funnel with a small cotton plug and 2 teaspoons of Na_2SO_4. Wash this with 50 ml petroleum ether.

h. Pour the sample through Na_2SO_4 to dry it and catch the sample in a clean 600 ml beaker.

i. Follow the sample with another 25 ml petroleum ether to wash the Na_2SO_4 and catch this washing in the beaker containing the sample.

j. Place the sample beaker in a 45°C water bath and evaporate to about 25 ml volume (about 2 hours). This evaporation can also be accomplished in a K-D evaporator.

k. Prepare a 4-inch florisil column and prewash with 50 ml petroleum ether. Discard the washing.

l. Follow the prewash with the sample. Add 150 ml of 1% (V/V) ethyl ether in petroleum ether and then 150 ml of 20% (V/V) ethyl ether in petroleum ether.

m. Add 100 microliters of distilled xylene to each elutriated volume.

n. Evaporate the collected volume to about 1 ml volume in a K-D evaporator.

o. Cool the evaporator under a cold water stream and wash down the large flask with the condensed solvent.

p. Reduce the sample down to an injectable quantity as rapidly as possible in a 45°C water bath. Thoroughly mix the contents before GLC detection.

q. Initial detection is done by GLC using 3% OV-1 and the Nicher-63 electron capture detector. Confirmation of positive amounts of chlorinated hydrocarbons is first done on 3% OV-17 using a Coulson electrolytic conductivity halide specific detector and then on 5% OV-17 plus 2% QF-1 using a Dohrmann micro-coulometric chloride specific detector.

Sodium and Potassium

The preferred method of analysis for sodium and potassium utilizes the flame photometer technique. Standard analytical procedures are followed as described in Standard Methods (page 317 and 283).

Satisfactory results can also be achieved by Atomic Absorbtion Spectrophotometry.

Sulphate

Sulphate is determined by a gravimetric method utilizing precipitation with barium as the barium sulphate solid. The filtered precipitate is ignited at 800°C for 1 hour prior to cooling and weighing. This method is used for both leachate and groundwater samples. Care must be taken with leachate samples to avoid error caused by precipitation of barium chloride during the sulfate analysis. The gravimetric method is described in detail in Standard Methods (page 331).

Settleable Solids

Settleable matter is determined according to the procedure given in Standard Methods (page 539) using the Imhoff cone.

Total Dissolved Solids (TDS)

Total dissolved solids is determined according to the procedure described in Standard Methods (page 290). There may be a significant dissolved organic fraction present in the leachate samples so that correspondence between specific conductance and TDS may be different from thet of the groundwater samples.

Total Suspended Solids (TSS)

The analytical procedure employed for determining suspended solids was originally described by Wycoff (4). Suspended solids are determined by leachate filtration through a glass fiber filter pad. The initial weight of each pad is determined before filtration. Following filtration, the pads are dried for one hour at 103°C and then weighed. The glass pads are weighed again after being ignited for 10 minutes at 600°C if the volatile fraction is to be determined. The method utilized is described in Standard Methods (page 537).

Volatile Acids

Volatile acids (total organic acids) is measured by the column-partition chromatographic method as given in Standard Methods (page 577). Special precaution should be exercised in maintaining the normality of the standard sodium hydroxide titrant by excluding CO_2 from the reagent bottle.

APPENDIX H

MONITORED DATA

TABLE OF CONTENTS

TITLE	PLATE NO.
Thermister Readings	H-1A, 1B, 1C
Gas Probe Readings	H-2A, 2B
Laboratory Gas Analysis -Cell A & B	H-3A, 3B
Laboratory Gas Analysis -Cell C & D	H-4A, 4B
Laboratory Gas Analysis -Cell E	H-5A, 5B
Leachate Analysis -Cell A	H-6A, 6B, 6C
Leachate Analysis -Cell B	H-7A, 7B, 7C
Leachate Analysis -Cell C	H-8A -8H
Leachate Analysis -Cell D	H-9A -9H
Leachate Analysis -Cell E	H-10A -10C
Water Analysis - Water Added to Cells B & C	H-11A, 11B, 11C, 11D
Groundwater Analysis -Well 1	H-12A -12E
Groundwater Analysis -Well 2	H-13A, 13B, 13C, 13D
Groundwater Analysis -Well 3	H-14A, 14B, 14C, 14D
Groundwater Analysis -Well 4	H-15A, 15B, 15C
Groundwater Analysis - Original Geotechnical Investigation	H-16A
Cell A & E Subdrain	H-17A, 17B, 17C
Observation Wells and Piezometers	H-18A
Cumulative Leachate Production	H-19A, 19B
Cumulative Leachate Production	H-20A (Discontinued)
Lysimeter Samples - Field Analysis	H-21A
Solution Analysis	H-22A
Record of Rainfall, Evaporation and Runoff	H-23A - 23T
Settlement Data	H-24A - 24D
Liquid Routing - Cell C	H-25A - 25H
Liquid Routing - Cell D	H-26A - 26H

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THERMISTER READINGS

DATE	TIME	AIR TEMP.	CELL A			CELL B			CELL C			CELL D			CELL E		
			Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top
1971																	
11-8	PM	25.8	17.1	-	-												
11-10	AM	24.5	26.6	19.1	-												
	PM	22.3	26.8	26.6	-												
11-11	AM	-	27.8	27.5	-												
11-12	AM	-	29.6	27.8	-												
11-14	AM	9.1	25.1	29.5	18.5												
	PM	-	24.8	29.2	19.1												
11-15	AM	9.8	24.2	28.4	27.6												
11-16	AM	13.2	22.4	28.4	42.5												
	PM	21.4	22.6	28.2	43.9											18.2		
11-17	AM	7.0	22.5	27.9	35.7											22.5		
	PM	20.3	22.3	27.9	33.4											24.5		
11-18	AM	13.5	22.3	27.5	28.6	18.1										30.7		
	PM	20.1	22.3	27.5	27.7	-										22.7		
11-19	AM	9.7	22.2	27.7	26.1	22.6	13.8									24.7		
	PM	17.5	22.2	27.6	25.8	22.8	19.4									25.0		
11-22	AM	7.2	21.9	27.1	24.0	23.4	25.5									30.8	[illegible]	
	PM	17.5	21.9	27.1	24.0	22.6	25.6									31.0	19.9	
11-23	AM	10.0	21.8	27.0	24.0	23.2	26.6									31.4	-	
	PM	12.0	21.8	27.0	23.9	23.2	27.4									31.9	20.1	
11-24	AM	10.5	21.8	27.0	23.9	23.4	28.9									31.5	20.3	
	PM	10.0	21.8	26.9	23.5	23.4	29.1									32.3	20.6	
11-29	AM	-	21.7	26.4	23.2	23.9	34.4									29.3	24.2	
11-30	AM	6.4	21.6	26.3	21.9	24.1	35.1									29.0	25.1	
	PM	21.0	21.6	26.3	21.9	24.2	35.2									26.9	27.1	
12-1	AM	10.1	21.7	26.5	21.7	24.4	35.5									26.9	27.8	
12-2	AM	7.5	21.6	26.2	21.4	24.7	35.7	20.6								26.4	26.8	
	PM	7.5	21.5	26.1	21.2	24.6	35.7	22.2								26.5	26.9	
12-3	AM	6.7	21.6	26.0	21.3	24.5	35.6	21.0								26.5	26.7	
12-6	AM	15.0	21.4	26.1	19.9	25.7	34.8	19.7								27.9	32.0	
	PM	18.1	21.4	25.8	19.7	25.7	34.7	20.9								27.8	32.0	
12-7	AM	12.5	21.4	25.8	19.1	25.9	34.4	21.7								27.9	32.5	
12-8	PM	15.4	21.4	25.6	18.8	29.3	33.1	21.7								27.8	32.8	
12-9	AM	12.1	21.6	25.6	18.3	29.7	32.9	22.5								27.8	33.0	
12-10	AM	15.0	21.4	25.5	17.8	30.5	32.7	22.6								27.8	33.1	

PLATE H-1A

THERMISTER READINGS

DATE	TIME	AIR TEMP.	CELL A			CELL B			CELL C			CELL D			CELL E		
			Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top	Temperature °C Bot.	Mid.	Top
1971																	
12-13	AM	11.5	21.3	24.9	16.6	30.4	32.1	21.4	31.6	22.6	-				28.0	32.8	19.2
12-14	AM	11.7	24.3	25.6	22.6	31.8	35.9	25.6	32.5	25.4	20.2				24.0	27.5	17.4
12-15	AM	11.3	21.7	25.1	16.1	30.2	31.9	21.3	30.1	23.7	24.2				27.5	33.4	18.8
12-16	PM	14.4	21.6	25.0	15.7	30.1	31.9	21.3	29.7	24.7	21.1				28.0	33.4	18.4
12-17	PM	14.3	-	-	-	29.8	31.6	21.2	29.3	25.4	20.0	11.3			-	-	-
12-20	PM	9.9	21.4	24.5	14.6	28.9	30.9	20.9	28.3	26.2	17.2	16.1			28.0	33.0	16.7
12-21	AM	6.6	-	-	-	-	-	-	-	-	-	17.7			-	-	-
12-28	PM	-	21.3	21.3	13.9	26.9	29.2	20.0	26.6	26.1	14.6	19.5	21.2	23.2	26.0	31.8	14.5
12-29	PM	-	21.2	23.7	13.7	26.7	25.8	19.8	26.4	26.0	14.5	19.5	22.1	24.3	27.8	31.5	14.1
12-30	AM	-	-	-	-	-	-	-	26.3	25.8	14.4	19.5	22.5	22.4	-	-	-
1972																	
1-11	AM	-	20.7	22.5	12.8	27.2	27.1	18.6	24.5	25.0	11.5	19.9	16.4	15.2	26.9	29.2	10.9
1-18	PM	-	20.5	22.0	11.1	24.2	25.3	17.3	23.8	20.3	10.7	15.9	15.1	13.7	26.1	27.4	10.9
1-27	AM	-	20.8	21.7	13.8	24.0	24.1	17.2	22.9	16.8	10.7	15.7	14.0	14.5	27.9	32.4	11.7
2-15	AM	-	19.7	20.6	17.4	22.7	22.2	15.9	20.6	13.5	10.6	12.4	11.5	10.8	23.2	23.7	12.2
3-14	AM	-	19.0	19.5	15.4	20.7	20.2	16.9	18.5	14.0	14.3	17.0	13.9	14.3	21.0	20.9	16.2
3-28	AM	-	18.6	18.5	15.4	20.2	19.7	17.5	18.2	15.6	14.7	16.5	15.9	16.0	20.6	19.9	17.6
4-11	AM		18.4	18.3	16.1	19.8	19.8	17.5	18.1	15.7	15.1	17.0	16.3	17.6	19.8	19.2	16.7
4-25	AM		18.2	18.1	16.9	19.6	19.2	17.6	17.0	15.7	15.4	16.6	16.6	17.0	19.3	18.8	17.8
5-9	AM		18.2	18.1	18.2	19.3	19.0	18.8	17.2	16.9	16.7	17.4	18.1	19.1	19.1	18.9	18.9
5-23	AM		18.1	18.2	20.0	19.2	19.0	20.0	17.9	18.4	18.5	18.8	20.0	21.8	18.8	18.7	21.0
6-6	AM		18.1	18.5	21.5	19.2	19.2	21.1	18.7	19.9	19.6	20.9	21.8	24.7	18.9	18.2	23.4
6-20	AM		18.1	18.5	23.4	19.2	19.5	22.6	19.4	20.4	21.7	22.9	23.5	27.6	18.9	19.5	25.4
7-11	AM		18.2	19.1	24.6	19.5	20.1	24.1	20.2	22.3	22.4	25.0	26.5	28.0	19.2	20.3	26.4
7-25	AM		18.5	19.4	25.6	19.7	20.6	25.1	21.1	23.6	22.6	26.9	27.9	29.2	19.5	20.9	26.2
8-8	AM		18.7	19.9	25.9	19.8	20.9	25.0	21.7	23.3	23.0	27.5	27.6	30.3	19.7	21.4	27.1
8-23	AM		18.9	20.4	26.0	20.2	21.3	25.0	21.9	23.6	23.2	24.9	26.6	29.3	19.8	21.6	27.0
9-7	AM		19.0	20.4	26.6	20.5	21.6	25.5	22.4	24.1	25.5	26.8	27.6	27.9	20.2	22.1	27.5
9-20	AM		-	20.7	-	-	21.9	-	-	24.0	-	-	28.1	-	-	22.4	-
10-11	AM	16.0	19.5	21.3	24.9	20.8	21.9	23.3	22.4	21.7	20.7	26.9	26.0	23.6	20.5	22.5	23.0
10-24	AM		Thermister Connections shorted-out by rainwater.														
11-8	AM	21.0	19.5	20.6	16.7	20.5	21.1	18.5	Shorted Out			25.2	21.5	16.8	20.6	21.1	20.6
11-21	AM	13.0	19.4	20.4	14.3	20.6	20.8	17.2	21.2	-	17.0	22.5	19.2	14.6	20.5	20.5	12.4

PLATE H-1B

THERMISTER READINGS

DATE	TIME	AIR TEMP.	CELL A Temperature °C			CELL B Temperature °C			CELL C Temperature °C			CELL D Temperature °C			CELL E Temperature °C		
			Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top	Bot.	Mid.	Top
11-30	AM	6.0	19.2	20.0	13.1	20.3	20.3	16.1	20.4	13.0	11.6	21.1	17.8	13.7	20.1	19.8	11.3
12-19	AM	14.0	18.9	19.1	7.8	19.7	19.3	12.3	-	22.7*	14.4	19.3	15.2	8.7	19.3	18.4	5.9
1-10-73	AM	11.0	18.2	17.6	8.0	18.7	17.7	-	17.7	9.5	7.2	13.1	13.0	9.1	18.1	16.6	6.4
1-23-73	AM	5.0	21.2	16.8	10.5	18.2	17.0	11.9	16.3	9.0	8.6	15.8	12.5	11.1	17.1	15.5	9.2
2-6-73	AM	11.5	15.4*	16.4	9.8	17.7	16.4	11.5	16.8	16.7	12.6	14.7	12.3	10.6	16.9	15.2	9.4
2-27-73	AM	13.0	17.1	16.1	11.9	17.3	15.8	12.4	10.3*	10.8*	10.3*	14.2	12.7	12.2	16.6	15.0	11.9
3-13-73	AM	11.5	17.1	16.0	11.9	15.9	15.7	12.7	15.5	11.2	10.6	14.1	15.1	12.3	16.5	15.1	11.6
3-27-73	AM	15.5	16.8	15.7	12.0	16.7	15.5	12.6	14.7	11.4	10.6	12.1	13.2	12.0	16.4	15.1	12.1
4-10-73	AM	21.0	16.7	15.8	14.6	16.6	15.4	13.7	14.1	11.9	12.8	14.1	13.3	13.5	16.5	15.2	15.7
4-24-73	AM	22.0	16.7	15.8	16.6	16.6	15.6	15.3	14.1	13.5	14.9	14.4	14.2	15.0	16.4	15.5	17.4
5-15-73	AM	22.0	16.9	16.6	20.3	16.7	16.1	18.5	15.1	15.9	18.0	15.1	16.4	18.1	16.7	16.3	21.9
6-5-73	AM	20.0	17.6	18.9	24.8	21.6	17.0	21.8	16.1	16.3	21.9	16.4	18.9	24.2	17.2	17.6	26.2
6-26-73	AM	27.0	17.6	18.3	26.8	17.7	18.2	24.4	17.7	21.1	21.8	18.1	21.8	23.8	17.9	19.1	28.3

* - Questionable Data

PLATE H-1C

GAS PROBE READINGS(1)

DATE	TIME	CELL A Explosibility-% Bot.	CELL A Mid.	CELL A Top	CELL B Explosibility-% Bot.	CELL B Mid.	CELL B Top	CELL C Explosibility-% Bot.	CELL C Mid.	CELL C Top	CELL D Explosibility-% Bot.	CELL D Mid.	CELL D Top	CELL E Explosibility-% Bot.	CELL E Mid.	CELL E Top
1971																
11-19	AM	0.65	0.67	0.45	0.28	0.18								0.28		
11-20	AM	*	1.00	0.60	0.42	0.40								*		
	PM	1.00	*	0.50	0.50	0.40								*		
11-23	AM	0.94	1.00	0.50	0.54	0.40								-		
	PM	*	1.00	0.50	0.50	0.40								-		
11-24	AM	1.00	*	0.50	0.48	0.40								*		
	PM	*	*	0.58	0.46	0.40								*	0.80	
11-29	AM	*	*	0.68	0.54	0.58								*	0.88	
	PM	-	-	-	0.70	0.80								*	0.88	
11-30	AM	*	*	0.60	0.70	0.60								*	0.88	
	PM	*	*	0.58	0.68	0.92								*	0.92	
12-1	AM	1.00	*	0.56	0.50	1.00								*	0.88	
12-2	AM	1.00	*	0.45	0.60	0.80	0.20							*	0.90	
	PM	1.00	*	0.30	0.60	0.40	0.20							*	[illegible]	
12-3	AM	1.00	*	0.30	0.60	0.60	0.20							*	0.92	
12-6	AM	1.00	*	0.40	0.54	0.54	-							0.84	-	
	PM	1.00	1.00	0.40	*	0.86	-							0.96	0.96	
12-7	AM	1.00	1.00	0.38	0.84	0.80	-							*	0.84	
12-8	PM	0.80	0.60	0.42	0.60	0.92	-							*	*	
12-9	AM	*	1.00	0.42	0.84	0.92	-							*	*	
12-10	AM	*	*	0.44	*	*	-							*	*	
12-13	PM	*	*	*	*	*	*							*	*	0.80
12-14	AM	*	*	0.50	*	*	*	*	*	0.2				*	*	*
12-15	AM	*	*	0.48	*	*	*	*	*	0.54				*	*	*
12-16	PM	*	*	0.46	*	*	*	*	*	0.66				-	-	-
12-17	PM	-	-	-	-	-	-	*	*	0.74	0.18			-	-	-
12-19	PM	-	-	-	0.28	0.14	-	-	-	-				-	-	-
12-20	PM	-	-	-	-	-	-	*	*	0.80	0.2			-	-	-

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(1) Gases collected in the gas probes were tested for concentration in parts per million of combustible toxic vapors present. Concentrations exceeded instrument readout limits of 2000 parts per million and are therefore not included in this table.

* - Indicates a reading exceeding the 0 - 1 range of the explosibility gauge.

PLATE H-2A

GAS PROBE READINGS(1)

DATE 1971	TIME	CELL A Explosibility-% Bot.	CELL A Mid.	CELL A Top	CELL B Explosibility-% Bot.	CELL B Mid.	CELL B Top	CELL C Explosibility-% Bot.	CELL C Mid.	CELL C Top	CELL D Explosibility-% Bot.	CELL D Mid.	CELL D Top	CELL E Explosibility-% Bot.	CELL E Mid.	CELL E Top
[illegible]	AM	[illegible]	[illegible]	[illegible]	[illegible]	3.5	-	-	-	-	-	-	-			
[illegible]	AM	3.5	4.6	0.3	-	1.0*	-	5.0	5.2	5.1	5.1	-	4.5	2.2	1.5	2.2
[illegible]	AM	3.2	3.2	-	2	2.0	-	4.0	-	4.3	-	[illegible]	[illegible]	1.8	[illegible]	[illegible]
[illegible]	[illegible]		-	-	[illegible]	[illegible]	1.0				-	-				
2-15		[illegible]	2.0	0.2	[illegible]	7.4	0.3				-	-	0.82	1.4	2.5	1.3
[illegible]		1.4	1.1	0.13	*	6.0	-	[illegible]	0.8	1.5	-	-	1.0	1.3	1.2	0.8
[illegible]	AM	0.7	1.0	1.3	[illegible]	5.5	0.6	0.8	0.8	1.3	-	-	1.6	1.2	2.2	[illegible]
[illegible]	AM	0.5	0.8	0.17	[illegible]	4.0	0.2	0.75	-	-	-	-	2.0	0.8	1.2	0.5
[illegible]		[illegible]	2.5	[illegible]				1.5	-	-	-	-		0.75	[illegible]	[illegible]
[illegible]	AM	0	0.01	0.01	0.09	0.04	0	0	[illegible]	-	-	-	0.04	0.02	0.03	0
[illegible]	AM	0.24	0.75	0.06	0	0.01	0.02	0.01	-	-	-	-	0.01	0.01	0.14	0
6-8		-	-	-	-	-	-	-	-	-	-	-	0	0.10	0.37	-
6-20		0.03	0.04	0.06	0.06	0.04	0.02	0.02	-	-	-	-	0.21	0.15	-	0.4
[illegible]	AM	0.01	0.02	0.01	0.04	0.03	0.01	0.00	-	-	-	-	[illegible]	0.01	0.01	0.15
7-28	AM	0.14	0.04	0.20	0.07	0.2	0.1	0.19	-	-	-	-	[illegible]	0.02	0.02	0.21
[illegible]	AM	-	0.02	-	-	0.03	-	0.02	-	-	-	-	0.50	-	0.06	-
[illegible]	AM	-	-	-	-	-	-	-	-	-	-	-	0.43	-	-	-
	PM	-		-	-		-		-	-	-	-		-		-
10-24	[illegible]	-	0.02	-	-	0.28	-	0.04	-	-	0.10	-	-	-	0.28	-
11-21	AM	-	0.02	-	-	0.14	-	0.05	-	-	Probes Blocked			-	0.2	-
12-19	AM	-	0.06	-	-	0.22	-	0.05	-	-	Probes Blocked			-	0.22	-
1972																
1-25	AM	-	0.03	-	-		-	0.05	-	-	Probes Blocked			-	0.35	-
2-27	AM	-	0.02	-	-	0.06	-	-	-	0.05	Probes Blocked			-	[illegible]	-
3-27	AM	-	0.02	-	-	0.48	-	0.06	-	-	Probes Blocked			-	0.1	-
[illegible]	AM	-	0.01	-	-	0.22	-	0.10	-	-	Probes Blocked			-	0.03	-
6-5	AM	-	0.04	-	-	0.10	-	0.10	-	-	Probes Blocked			-	0.08	-

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(1) Gases collected in the gas probes were tested for concentration in parts per million of combustible toxic vapors present. Concentrations exceeded instrument readout limits of 2000 parts per million and are therefore not included in this table.

* Readings made with dilution valve. Increases explosibility range to 0-10.

Indicates a reading exceeding the 0-1 range of the explosibility gauge.

PLATE H-2B

LABORATORY GAS ANALYSIS

CELLS A & B

* PROBE NO.	GAS COMPONENTS	DATE										
		12-8-7	1-3-72	1-18-72	1-27-7	2-15-72	3-2-72	3-14-72	4-25-72	5-23-72	6-20-72	7-25-72
A-B	Carbon Dioxide		45.4		65.3		75.8				69.7	
	Oxygen		13.7		4.6		1.4				0.4	
	Nitrogen		40.9		30.1		22.7				29.9	
	Methane		0		0		0.1				Tr	
A-M	Carbon Dioxide	30.0	58.0					76.5	75.2		70.5	68.7
	Oxygen	12.4	8.5					2.1	0.4		0.5	0.5
	Nitrogen	57.6	33.5					21.3	24.4		29.0	30.8
	Methane	0	0					0.1	Tr		Tr	Tr
A-T	Carbon Dioxide		38.3								41.5	
	Oxygen		8.0								1.9	
	Nitrogen		53.7								56.6	
	Methane		0.								Tr	
B-B	Carbon Dioxide					81.3				95.0		
	Oxygen					4.2				0.4		
	Nitrogen					14.5				4.6		
	Methane					0.0				Tr		
B-M	Carbon Dioxide	46.4	71.0	54.6		68.8		92.9	94.1	89.8		82.9
	Oxygen	8.6	7.0	10.8		7.1		1.5	0.6	1.0		1.2
	Nitrogen	45.0	22.0	34.6		24.1		5.6	5.3	9.2		15.9
	Methane	0	0	0		0.0		0.0	Tr	Tr		Tr
B-T	Carbon Dioxide					59.4				73.8		
	Oxygen					6.6				0.3		
	Nitrogen					34.0				25.9		
	Methane					0.0				Tr		

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-3A

LABORATORY GAS ANALYSIS

CELLS A & B

* PROBE NO.	GAS COMPONENTS	DATE										
		8-23-72	9-20-72	10-24-7	11-21-72	12-19-72	1-23-73	2-27-73	3-27-73	6-5-73		
A-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
A-M	Carbon Dioxide	66.0	65.3	66.4	69.7	71.6	70.9	73.4	73.7	77.4		
	Oxygen	1.2	0.8	0.6	0.4	0.4	0.5	1.0	0.4	0.3		
	Nitrogen	32.8	33.9	33.0	29.9	27.9	28.4	25.2	25.5	21.8		
	Methane	Tr	Tr	Tr	Tr	0.1	0.2	0.4	0.4	0.5		
A-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
B-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
B-M	Carbon Dioxide	81.8	81.7	74.3	79.1	78.7		78.6	73.6	76.9		
	Oxygen	0.9	0.4	0.9	0.6	0.7		0.6	0.7	0.8		
	Nitrogen	17.3	17.8	24.7	20.1	20.3		20.3	25.1	21.1		
	Methane	Tr	0.1	0.1	0.2	0.3		0.5	0.6	1.2		
B-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-3B

LABORATORY GAS ANALYSIS

CELLS C & D

* PROBE NO.	GAS COMPONENTS	DATE										
		1-11-72	1-18-72	1-27-72	2-15-72	3-2-72	3-14-72	3-28-72	4-25-72	5-23-72	6-20-72	7-25-72
C-B	Carbon Dioxide	64.9		68.7	72.9	75.7			97.8	99.8	98.8	99.4
	Oxygen	7.4		7.0	6.5	5.6			0.4	Tr	0.2	Tr
	Nitrogen	27.7		24.3	20.6	18.7			1.7	0.1	0.9	0.1
	Methane	0		Tr	0.0	Tr.			0.1	0.1	0.1	0.5
C-M	Carbon Dioxide	79.6	61.8		82.6		87.1					
	Oxygen	3.8	9.3		3.9		3.1					
	Nitrogen	16.6	28.9		13.5		9.8					
	Methane	0	Tr		0.0		Tr					
C-T	Carbon Dioxide	67.4		68.7	76.8	80.0						
	Oxygen	6.9		7.3	5.1	3.8						
	Nitrogen	25.7		24.0	18.1	16.2						
	Methane	0		Tr	0.0	Tr.						
D-B	Carbon Dioxide	62.8										
	Oxygen	8.3										
	Nitrogen	28.9										
	Methane	0										
D-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-T	Carbon Dioxide	70.9		83.9	92.9	96.7		98.5	98.1		98.9	94.4
	Oxygen	6.1		3.3	1.4	0.2		0.1	0.1		Tr	0.1
	Nitrogen	23.0		12.8	5.7	3.1		1.4	1.8		1.1	2.2
	Methane	0		Tr	0.0	0.0		0.0	Tr		Tr	3.4

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-4A

LABORATORY GAS ANALYSIS

CELLS C & D

* PROBE NO.	GAS COMPONENTS	DATE										
		8-23-72	9-11-72	10-11-72	10-24-72	11-21-72	12-19-72	1-23-73	2-27-73	3-27-73	6-5-73	
C-B	Carbon Dioxide	98.2		96.4	96.0	94.9	92.7	90.1	89.3	89.1	90.0	
	Oxygen	Tr		Tr	Tr	Tr	0.1	Tr.	0.1	Tr	Tr	
	Nitrogen	0.2		0.1	0.2	0.3	0.4	0.2	0.3	0.2	0.3	
	Methane	1.6		3.5	3.8	4.8	6.8	9.7	10.3	10.7	9.6	
C-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
C-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-B	Carbon Dioxide				80.0							
	Oxygen				0.1							
	Nitrogen				0.6							
	Methane				19.3							
D-M	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
D-T	Carbon Dioxide	79.1	71.6									
	Oxygen	Tr	0.4									
	Nitrogen	1.0	1.2									
	Methane	19.9	26.8									

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-4B

LABORATORY GAS ANALYSIS
CELL E

* PROBE NO.	GAS COMPONENTS	DATE										
		12-8-71	1-3-72	1-18-72	2-15-72	3-2-72	3-14-72	4-25-72	6-20-72	7-25-72	8-23-72	9-20-72
E-B	Carbon Dioxide		52.2	65.7		72.8			86.2			
	Oxygen		9.2	7.7		5.4			0.7			
	Nitrogen		36.6	24.4		18.9			10.2			
	Methane		2.0	2.2		2.9			2.9			
E-M	Carbon Dioxide	65.5	49.6	68.3	63.1		87.9	88.1	77.6	79.6	81.6	80.1
	Oxygen	2.5	12.3	7.3	6.8		0.8	0.2	2.3	1.3	0.2	0.5
	Nitrogen		37.5	23.1	28.8		9.4	9.6	18.1	16.8	15.7	17.1
	Methane	0.2	0.6	1.3	1.3		1.9	2.1	2.0	2.3	2.5	2.3
E-T	Carbon Dioxide		61.4	62.8		57.7			52.4			
	Oxygen		7.5	3.5		3.2			0.8			
	Nitrogen		30.8	33.1		38.3			46.2			
	Methane		0.3	0.6		0.7			0.6			
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates bottom, middle or top probe.

PLATE H-5A

LABORATORY GAS ANALYSIS
CELL E

* PROBE NO.	GAS COMPONENTS	DATE										
		10-24-73	11-21-72	12-19-72	2-27-73	3-27-73	4-24-73	6-5-73				
E-B	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
E-M	Carbon Dioxide	75.3	83.0	90.2	94.9	93.5	93.0	91.9				
	Oxygen	0.3	0.2	0.2	0.1	0.1	0.1	0.2				
	Nitrogen	22.0	14.7	7.5	3.3	4.4	4.5	5.4				
	Methane	2.4	2.1	2.1	1.7	2.0	2.4	2.5				
E-T	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											
	Carbon Dioxide											
	Oxygen											
	Nitrogen											
	Methane											

* - First letter indicates cell; second letter indicates top, middle or bottom probe.

PLATE H-5B

LEACHATE ANALYSIS

CELL A

	SAMPLE DATE				
COMPONENT *	12-15-71	12-21-71	1-3-72	2-15-72	9-7-72
Alkalinity ($CaCO_3$)				240	1300
B.O.D.					2250
Cadmium					0
Calcium				44	20
C.O.D.				16200	3260
Chloride				56	56
Color (Color Units)				28	30
Copper				< 0.2	< 0.08
Dissolved Oxygen ppm		1.4		1.6	4.6
Elect. Cond. µ mhos/cm		285		500	1000
Fecal Coli. MPN/100 ml					< 3
Fecal Strep. MPN/100 ml					< 3
Iron					
Lead				< 0.5	0.16
Magnesium				2.6	17
Mercury				0.0006	0.0065
Nitrogen - Ammonia				4.5	0
Nitrogen - Organic				15.6	3
Nitrogen - Nitrate				0.0	0
Phosphate-Total, as P				2.0	0
P.C.B. ppb					
Potassium				4.8	6.6
Sodium				80	128
Solids - T.D.S.				724	724
Solids - T.S.S.				60	70
Solids - Settle. ml/l					< 0.1
Sulphate				28	20
Temperature** (°C)				17.0	28.5
Volatile Acids				48	430
Zinc				2.1	0.23
pH	5.1	4.8	4.7	5.0	5.0

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-6A

LEACHATE ANALYSIS

CELL A

	SAMPLE DATE				
COMPONENT *	10-11-72	11-21-72	11-30-72	1-10-73	2-27-73
Alkalinity	1370	2160		3920	2310
B.O.D.	2850	16,200		19,200	12,700
Cadmium	0	<0.03		<0.1	<0.05
Calcium	48	938		1082	440
C.O.D.	3630	22,440		20,300	17,600
Chloride	58	390		490	424
Color (Color Units)	28	350		125	75
Copper	0.16	0.15		0.44	0.06
Dissolved Oxygen ppm	1.4	0.1	0.4	0.8	0.4
Elect. Cond. µ mhos/cm	800	5250	7000	7250	5000
Fecal Coli. MPN/100 ml	<3	< 3		<3	
Fecal Strep. MPN/100 ml	<3	9.4		<3	
Iron	22.5	750		1050	945
Lead	0.12	0.44		0.55	1.29
Magnesium	18	590		760	608
Mercury	0.0035	0.013		0.0100	0.0120
Nitrogen - Ammonia	3	81		48	66
Nitrogen - Organic	14	89		42	29
Nitrogen - Nitrate	0.10	0.0		0.90	0.40
Phosphate-Total, as P	<0.1	1.4		2.8	1.4
P.C.B. ppb			0		
Potassium	6.1	130		148	120
Sodium	161	300		338	288
Solids - T.D.S.	820	11,800		14,080	10,700
Solids - T.S.S.	42	200		98	14
Solids - Settle. ml/l					
Sulphate			250		
Temperature** (°C)	16.0	10.0	7.0	10.0	12.0
Volatile Acids		10,000		12,700	9400
Zinc	0.58	9.0		5.5	3.2
pH	4.7	4.7	4.8	4.8	5.4

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-6B

LEACHATE ANALYSIS
CELL A

	SAMPLE DATE				
COMPONENT *	3-13-73	3-27-73	4-10-73		
Alkalinity			2835		
B.O.D.			17,500		
Cadmium			< 0.05		
Calcium			858		
C.O.D.			18,300		
Chloride			440		
Color (Color Units)			450		
Copper			0.22		
Dissolved Oxygen ppm			0.6		
Elect. Cond. µ mhos/cm			4750		
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron			850		
Lead			1.81		
Magnesium			548		
Mercury			0		
Nitrogen - Ammonia			55		
Nitrogen - Organic			17		
Nitrogen - Nitrate					
Phosphate-Total, as P			1.6		
P.C.B. ppb	0				
Potassium			115		
Sodium			272		
Solids - T.D.S.			11,020		
Solids - T.S.S.			16		
Solids - Settle. ml/l					
Sulphate	108				
Temperature ** (°C)			20.0		
Volatile Acids			9900		
Zinc			3.0		
pH			4.9		

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-6C

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE 12-7-71	12-10-71	12-15-71	12-21-71	12-28-71
Alkalinity ($CaCO_3$)	0	0			972
B.O.D.	13,500	15,300			32,400
Cadmium					
Calcium	320	200			1,681
C.O.D.	15,933	17,920			42,600
Chloride	1,475	998			1,800
Color (Color Units)	1,600	2,000			2,500
Copper					
Dissolved Oxygen ppm	1.4	< 0.5		1.1	0.8
Elect. Cond. µ mhos/cm				14,500	12,000
Fecal Coli. MPN/100 ml	>24,000	9.3 $\times 10^5$			300
Fecal Strep. MPN/100 ml	>2,400	2.1 $\times 10^7$			1.5 $\times 10^5$
Iron					
Lead					
Magnesium	320	550			924
Mercury					
Nitrogen - Ammonia					0.25
Nitrogen - Organic					170
Nitrogen - Nitrate	66	58			2.5
Phosphate-Total, as P	0.029	0.084			0
P.C.B. ppb		0			0
Potassium					
Sodium					
Solids - T.D.S.	15,970	25,028			29,663
Solids - T.S.S.	421	496			148
Solids - Settle. ml/l					< 0.1
Sulphate					
Temperature ** (°C)					
Volatile Acids					6,360
Zinc					
pH	4.4	4.2	4.5	4.3	4.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-7A

LEACHATE ANALYSIS
CELL B

COMPONENT *	SAMPLE DATE 1-3-72	1-7-72	10-24-72	11-30-72	1-23-73
Alkalinity	2360		6880		5880
B.O.D.	28,350		45,000		40,000
Cadmium	<0.25		0.19		< 0.1
Calcium	2950		1640		1323
C.O.D.	41,000		58,450	61,700	51,400
Chloride	1725		2000		498
Color (Color Units)			950		650
Copper	3.6		0.29		0.20
Dissolved Oxygen ppm	2.4	7.4	0.5	0.2	0.3
Elect. Cond. µ mhos/cm		14,000	20,000	10,000	9500
Fecal Coli. MPN/100 ml	< 3.0		6.0	< 3.0	<3.0
Fecal Strep. MPN/100 ml	2.1 $\times 10^4$		2400	230	360
Iron			408		425
Lead	3.0		0.95		0.35
Magnesium	815		816		344
Mercury	0.006		0.0035		0.0136
Nitrogen - Ammonia	226		780		560
Nitrogen - Organic	20		570		388
Nitrogen - Nitrate	14		0.4	0	0
Phosphate-Total, as P	83		5.0		0.8
P.C.B. ppb			0		
Potassium	1500		1560		1180
Sodium	1325		1550		1072
Solids - T.D.S.	42,270		29,000		24,520
Solids - T.S.S.	368		1800		124
Solids - Settle. ml/l	<0.1				
Sulphate			980	1070	
Temperature ** (°C)	14.0	12.5	19.0	6.0	9.0
Volatile Acids	10,800		17,500		14,400
Zinc	140		62		24
pH	4.2	4.4	5.0	5.3	5.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-7B

LEACHATE ANALYSIS
CELL B

	SAMPLE DATE				
COMPONENT *	3-13-73				
Alkalinity	4725				
B.O.D.	22,800				
Cadmium	< 0.05				
Calcium	1130				
C.O.D.	32,200				
Chloride	1320				
Color (Color Units)	275				
Copper	0.18				
Dissolved Oxygen ppm	0.8				
Elect. Cond. µ mhos/cm	4500				
Fecal Coli. MPN/100 ml	< 3.0				
Fecal Strep. MPN/100 ml	93.0				
Iron	348				
Lead	0.33				
Magnesium	378				
Mercury	.0044				
Nitrogen - Ammonia	480				
Nitrogen - Organic	250				
Nitrogen - Nitrate	0.1				
Phosphate-Total, as P	4.2				
P.C.B. ppb	0				
Potassium	940				
Sodium	816				
Solids - T.D.S.	17,480				
Solids - T.S.S.	36				
Solids - Settle. ml/l	-				
Sulphate	1036				
Temperature** (°C)	13.0				
Volatile Acids	10,100				
Zinc	10.8				
pH	5.2				

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-7C

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	12-15-71	12-21-71	12-28-71	1-3-72	1-7-72
Temperature** (°C)				11.0	11.0
Alkalinity ($CaCO_3$)			0	4900	
B.O.D.			15,900	22,500	
Cadmium				< 0.25	
Calcium			1041	1700	
C.O.D.			27,300	26,750	
Color (Color Units)			750		
Copper				2.15	
Chloride			1300	1225	
Dissolved Oxygen ppm		1.4	0.8	1.0	0.5
Elect.Cond. µ mhos/cm		11,200	9500		11,400
Fecal Coli. MPN/100 ml			230,000	4	
Fecal Strep.MPN/100 ml			4,300,000	15,000	
Lead				< 2.0	
Magnesium			1070	725	
Mercury				0.0012	
Nitrogen - Ammonia			0.33	304	
Nitrogen - Organic			310	186	
Nitrogen - Nitrate			4.3	4.25	
Nitrogen - Nitrite					
Phosphate-Total, as P			0.38	3.26	
P.C.B. ppb			0 ***		
Potassium				445	
Sodium				820	
Solids - T.D.S.			15,400	16,890	
Solids - T.S.S.			323	260	
Solids - Settle. ml/l			<0.1	<0.1	
Volatile Acids				11,520	
Zinc				28	
pH	4.3	4.7	5.1	5.1	5.4
Sulphate					

* Units in mg/l unless noted ***Detected .06 ppb Lindane.
**Temperature of sample when tested for DO, EC and pH.

Plate H-8A

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	1-18-72	2-15-72	3-2-72	3-14-72	3-28-72
Temperature** (°C)	8.5	19.0	16.5	21.0	18.0
Alkalinity ($CaCO_3$)	5480	5240	4450	4940	4750
B.O.D.	24,600	26,400	27,000	28,200	22,950
Cadmium			< 0.1		
Calcium	1200	1200	1600	1100	1000
C.O.D.	33,500	39,400	32,620	30,500	30,100
Color (Color Units)	700	750	700	500	820
Copper			0.6		
Chloride	1200	1120	1100	1060	1010
Dissolved Oxygen ppm	1.7	0.5	1.0	0.3	0.6
Elect.Cond. µ mhos/cm	11,000	11,000	10,000	12,500	10,000
Fecal Coli. MPN/100 ml	3			3	< 3
Fecal Strep.MPN/100 ml	400			43,000	150,000
Lead			< 0.5		
Magnesium	760	500	550	410	450
Mercury			0.0014		
Nitrogen - Ammonia	240	550	800	570	650
Nitrogen - Organic	174	432	400	280	296
Nitrogen - Nitrate	3.24	3.8	3.10	4.2	4.0
Nitrogen - Nitrite	0.030				
Phosphate-Total, as P	9.8	34.0	41.7	36	34.0
P.C.B. ppb			0.35		0.40
Potassium			845		
Sodium			950		
Solids - T.D.S.	15,190	19,336	18,444	18,025	16,288
Solids - T.S.S.	128	182	88	325	144
Solids - Settle. ml/l	<0.1			<0.1	0.8
Volatile Acids			10,100	9400	9100
Zinc			42		
pH	5.1	5.1	5.1	5.1	5.1
Sulphate		880		820	

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC and pH.

Plate H-8B

LEACHATE ANALYSIS
CELL C

COMPONENT *	SAMPLE DATE 4-11-72	4-25-72	5-9-72	5-23-72	6-6-72
Alkalinity (CaCO$_3$)	4,050	3,750	4,350	4,100	3,600
B.O.D.	20,400	17,400	21,300	23,700	18,000
Cadmium	<0.1		<0.1		0.1
Calcium	1,200	1,000	980	880	1,050
C.O.D.	27,948	24,300	16,680	24,600	20,276
Chloride	880	860	810	740	570
Color (Color Units)	1,700	800	560	400	350
Copper	<0.25		<0.2		0.15
Dissolved Oxygen ppm	0.9	0.4	0.4	0.4	0.2
Elect. Cond. µ mhos/cm	9,000	9,500	11,000	9,750	10,000
Fecal Coli. MPN/100 ml	4	<3	<3	6	92
Fecal Strep. MPN/100 ml	7,500,000	9,300,000	230,000	43,000	1,600,000
Iron					
Lead	<1.0		<1.0		0.8
Magnesium	450	450	400	220	220
Mercury	0.0016		0.015		0.0102
Nitrogen - Ammonia	383	470	592	656	632
Nitrogen - Organic	297	328	312	240	800
Nitrogen - Nitrate	2.94	4.22	2.40	3.6	1.8
Phosphate-Total, as P	9.9	29.1	40.6	41.0	40.3
P.C.B. ppb		0		0	
Potassium	837		750		560
Sodium	700		800		550
Solids - T.D.S.	13,358	11,960	11,980	12,330	10,080
Solids - T.S.S.	220	96	356	~84	58
Solids - Settle. ml/l	0.1	0.2	<0.1	0.5	0.6
Sulphate	448		448		340
Temperature ** (°C)	17.5	21.0	19.5	19.0	20.0
Volatile Acids	8,460	8,560	9,700	8,720	7,730
Zinc	30		30		22
pH		5.2	5.1	5.1	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-8C

LEACHATE ANALYSIS
CELL C

COMPONENT *	SAMPLE DATE 6-20-72	7-11-72	7-25-72	8-8-72	8-23-72
Alkalinity	2600	4400	3800	2800	2600
B.O.D.	14,700	17,960	10,100	13,600	10,540
Cadmium		<0.1	<0.1	<0.05	
Calcium	700	720	600	630	610
C.O.D.	20,720	23,490	16,630	17,910	17,170
Chloride	530	480	410	430	420
Color (Color Units)	350				150
Copper		0.15	0.18	0.13	
Dissolved Oxygen ppm	0.8	0.7	0.0	0.4	0.4
Elect. Cond. µ mhos/cm	8000	7500	7200	7300	7000
Fecal Coli. MPN/100 ml				<3	
Fecal Strep. MPN/100 ml				3	
Iron		140	120	130	
Lead		<0.10	0.10	0.20	
Magnesium	200	220	192	255	194
Mercury		0.0065		0.018	
Nitrogen - Ammonia	416	351	303	341	338
Nitrogen - Organic	504	90	69	89	79
Nitrogen - Nitrate	4.60	0.04	0.05	0.04	
Phosphate-Total, as P	36.3	24.0	16.4	23.0	26.0
P.C.B. ppb					
Potassium		480	380	460	
Sodium		476	468	380	
Solids - T.D.S.	5180	9324	7470	7642	7268
Solids - T.S.S.	48	52	69	206	178
Solids - Settle. ml/l					
Sulphate					
Temperature ** (°C)	19.0	22.0	21.5	20.5	22.0
Volatile Acids		7270		5910	
Zinc		13	10	9.5	
pH	5.0	5.1	5.0	5.2	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-8D

LEACHATE ANALYSIS

CELL C

COMPONENT *	SAMPLE DATE 9-7-72	9-20-72	10-11-72	10-24-72	11-8-72
Alkalinity	3400	3100	1860	2160	1370
B.O.D.	10,000	9200	9900	10,350	13,000
Cadmium	<0.05		<0.05	0.05	0.06
Calcium	570	570	440	600	560
C.O.D.	16,320	15,130	13,430	16,780	15,660
Chloride	323	540	380	370	650
Color (Color Units)	275	225	175	240	150
Copper	0.07		0.08	0.06	0.11
Dissolved Oxygen ppm	0.2	1.2	0.0	0.4	0.2
Elect. Cond. µ mhos/cm	6000	6100	5600	7200	5000
Fecal Coli. MPN/100 ml	6		3		<3
Fecal Strep. MPN/100 ml	<3		9.3		4.0
Iron	115		150	154	170
Lead	0.22		0.15	0.35	0.15
Magnesium	158	148	154	180	166
Mercury	0.060		0.0065		0.0035
Nitrogen - Ammonia	306	282	283	330	294
Nitrogen - Organic	68	64	71	150	67
Nitrogen - Nitrate	0.5	0.5	0.2	0.4	0.10
Phosphate-Total, as P	17.0	18.0	16.4	12.0	13.0
P.C.B. ppb	0				
Potassium	340		260	360	340
Sodium	312		336	568	340
Solids - T.D.S.	6800	7160	6630	7950	6860
Solids - T.S.S.	88	78	120	50	320
Solids Settle. ml/l	<0.1				
Sulphate	131				
Temperature** (°C)	21.5	22.5	18.0	22.0	20.0
Volatile Acids	6060		5280	6240	5940
Zinc	7.5		6.5	7.5	8.5
pH	5.0	4.9	4.9	4.8	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-8E

LEACHATE ANALYSIS

CELL C

COMPONENT *	SAMPLE DATE 11-21-72	11-30-72	12-19-72	1-10-73	1-23-73
Alkalinity	1760	1760	1940	1960	1568
B.O.D.	11,800	11,100	14,550	10,800	10,600
Cadmium	0.04	0.05	<0.1	<0.1	<0.1
Calcium	561	520	601	553	480
C.O.D.	16,320	13,[illegible]70	16,510	13,300	13,000
Chloride	310	284	558	290	220
Color (Color Units)	225	175	175	125	75
Copper	0.10	0.07	0.10	0.05	0.05
Dissolved Oxygen ppm	0.2	0.2	0.2	0.3	0.4
Elect. Cond. µ mhos/cm	4500	6000	5600	5500	4200
Fecal Coli. MPN/100 ml		4		6.1	
Fecal Strep. MPN/100 ml		3		<3	
Iron	160	163		148	185
Lead	0.17	0		0.19	0.20
Magnesium	320	146		118	240
Mercury		0.0038		0.0102	0.0150
Nitrogen - Ammonia	301	265	281	224	242
Nitrogen - Organic	63	60	51	39	60
Nitrogen - Nitrate	0	0.17	0.10	0.26	0.34
Phosphate-Total, as P	2.4	3.2	2.2	1.6	2.4
P.C.B. ppb		0			
Potassium	270	270	320	206	223
Sodium	330	320	336	250	304
Solids - T.D.S.	6500	6160	7040	6260	5180
Solids - T.S.S.	900	132	16	72	34
Solids - Settle. ml/l		0			
Sulphate		114			
Temperature** (°C)	18.0	15.0	15.0	15.0	14.0
Volatile Acids	5700	5520		5500	
Zinc	8.0	3.3	8.5	5.0	6.0
pH	5.2	4.9	5.0	4.9	5.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-8F

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	2-6-73	2-27-73	3-13-73	3-27-73	4-10-73
Alkalinity	1890	1470	1575	1575	1575
B.O.D.	10,500	9600	7300	9400	9000
Cadmium	<0.1	<0.05	<0.05	<0.05	<0.05
Calcium	480	545	457	425	480
C.O.D.	12,200	12,900	10,700	10,100	11,200
Chloride	526	405	195	293	205
Color (Color Units)	100	100	75	100	75
Copper	0.06	0.06	0.05	0.06	0.08
Dissolved Oxygen ppm	0.6***	0.6***	0.4	0.4	0.3
Elect. Cond. µ mhos/cm	2900	3300	3625	2200	1500
Fecal Coli. MPN/100 ml	<3.0		3.0		
Fecal Strep. MPN/100 ml	<3.0		≤3.0		
Iron	176	278	165	173	195
Lead	<0.1	<0.1	0.1		<0.1
Magnesium	116	141	96	104	108
Mercury	0.0166	0.0123	0.0007		0.0034
Nitrogen - Ammonia	218	215	180	176	185
Nitrogen - Organic	42	54	36	36	19
Nitrogen - Nitrate	0.34	0.40	0.30	0.32	
Phosphate-Total, as P	3.6	4.2	3.0	4.0	2.2
P.C.B. ppb			0		
Potassium	218	200	163	165	190
Sodium	260	272	228	236	252
Solids - T.D.S.	5260	5400	4600	4540	4960
Solids - T.S.S.	4	26	56	34	20
Solids - Settle. ml/l					
Sulphate			118		
Temperature** (°C)	15.0	14.0	15.5	16.5	20.0
Volatile Acids	5040		4200		4500
Zinc	4.6	4.5	4.3	2.8	3.5
pH	4.8	5.2	4.7	4.9	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.
*** Questionable Result

Plate H-8G

LEACHATE ANALYSIS

CELL C

	SAMPLE DATE				
COMPONENT *	4-24-73	5-15-73	6-5-73	6-26-73	
Alkalinity	1365	1260	1470	1575	
B.O.D.	9100	6300	6800	8200	
Cadmium	<0.05	<0.05	0	<0.05	
Calcium	400	385	417	360	
C.O.D.	10,800	9490	9860	9600	
Chloride	303	254	340	166	
Color (Color Units)	75				
Copper	0.05	0.04	0.05	0.02	
Dissolved Oxygen ppm	0.7	0.6	0.2	0.5	
Elect. Cond. µ mhos/cm	1950	1900	2400	2050	
Fecal Coli. MPN/100 ml				26.0	
Fecal Strep. MPN/100 ml				<3.0	
Iron	220	175	220	218	
Lead	<0.1	0	0	Tr.	
Magnesium	98	88	90	86	
Mercury	0.0078	0.0018		0.0002	
Nitrogen - Ammonia	179	179	196	173	
Nitrogen - Organic	28	31	26	22	
Nitrogen - Nitrate	0.24	0.68	0	0.56	
Phosphate-Total, as P	12.0	0.8	4.8	1.4	
P.C.B. ppb					
Potassium	158	128		123	
Sodium	228	256		226	
Solids - T.D.S.	4800	4120	4400	4960	
Solids - T.S.S.	4	28			
Solids - Settle. ml/l					
Sulphate		56		63	
Temperature** (°C)	19.0	21.0	18.5	25.0	
Volatile Acids		3900		4380	
Zinc	3.8	2.5	1.8	0.6	
pH	5.0	5.1	5.0	5.1	

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-8H

LEACHATE ANALYSIS

CELL D

COMPONENT *	SAMPLE DATE 1-7-72	1-11-72	1-18-72	2-15-72	3-2-72
Temperature** (°C)	13.0	8.0	9.0	18.5	16.5
Alkalinity (CaCO$_3$)			3050	4450	4800
B.O.D.			20,400	20,850	22,050
Cadmium			0.1		< 0.1
Calcium			1560	1300	1400
C.O.D.			89,520	26,300	29,800
Color (Color Units)			1300	550	440
Copper			0.4		0.25
Chloride			1210	1030	980
Dissolved Oxygen ppm	0.8	1.1	1.0	0.4	1.1
Elect.Cond. μ mhos/cm	7800	12,000	12,000	11,000	9000
Fecal Coli. MPN/100 ml			3.0		
Fecal Strep. MPN/100 ml			29,000,000		
Lead			2.0		< 0.5
Magnesium			560	500	500
Mercury			0.003		0.0058
Nitrogen - Ammonia			194	350	408
Nitrogen - Organic			210	270	182
Nitrogen - Nitrate			4.70	3.1	1.90
Nitrogen - Nitrite			0.080		
Phosphate-Total, as P			79.2	41.2	25
P.C.B. ppb			0***		0
Potassium			910		740
Sodium			980		900
Solids - T.D.S.			21,010	14,196	16,252
Solids - T.S.S.			238	122	32
Solids - Settle. ml/l			< 0.1		
Volatile Acids			8850		8690
Zinc			95		40
pH	4.6		4.6	5.0	5.1
Sulphate				1040	

* Units in mg/l unless noted

**Temperature of Sample when tested for DO, EC and pH.

***Detected .0, ppb Lindane.

Plate H-9A

LEACHATE ANALYSIS

CELL D

COMPONENT *	SAMPLE DATE 3-14-72	3-28-72	4-11-72	4-25-72	5-9-72
Temperature** (°C)	19.5	17.5	17.0	20.0	19.0
Alkalinity (CaCO$_3$)	5950	5050	4950	4700	5500
B.O.D.	24,000	22,800	21,750	19,800	23,100
Cadmium			< 0.1		< 0.1
Calcium	1200	1300	900	1000	1000
C.O.D.	30,300	31,900	32,330	30,700	33,640
Color (Color Units)	270	520	1700	900	600
Copper			< 0.25		< 0.2
Chloride	1020	1020	920	1020	1090
Dissolved Oxygen ppm	0.1	0.4	0.6	0.5	0.2
Elect.Cond. μ mhos/cm	12,000	10,000	10,000	9000	12,500
Fecal Coli. MPN/100 ml	3	< 3	< 3	< 3	6
Fecal Strep. MPN/100 ml	23,000	43,000	2000	430,000	< 3
Lead			1.0		< 1.0
Magnesium	450	500	600	550	500
Mercury			0.0028		0.0066
Nitrogen - Ammonia	378	360	423	500	580
Nitrogen - Organic	306	209	207	236	264
Nitrogen - Nitrate	3.0	3.80	3.60	4.22	2.38
Nitrogen - Nitrite					
Phosphate-Total, as P	40	36.0	17.8	22.1	28.7
P.C.B. ppb		0.20		0	
Potassium			727		727
Sodium			860		1020
Solids - T.D.S.	15,994	16,948	16,132	15,240	16,110
Solids - T.S.S.	88	50	228	58	409
Solids - Settle. ml/l	0.15	0.4	< 0.1	< 0.1	< 0.1
Volatile Acids	8430	10,190	8,300	10,200	10,900
Zinc			40		30
pH	5.1	5.1		5.2	5.2
Sulphate	920		794		920

* Units in mg/l unless noted

**Temperature of sample when tested for DO, EC, and pH

Plate H-9B

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 5-23-72	6-6-72	6-20-72	7-11-72	7-25-72
Alkalinity	5600	5800	4500	6500	7900
B.O.D.	33,600	30,600	33,000	25,950	24,400
Cadmium		0.13		<0.1	0.1
Calcium	1300	1800	1200	1320	1416
C.O.D.	36,040	34,524	33,040	35,060	36,400
Chloride	1090	1050	1100	1030	1070
Color (Color Units)	360	350	400		
Copper		0.10		0.15	0.16
Dissolved Oxygen ppm	0.1	0.2	0.2	0.4	0.0
Elect. Cond. μ mhos/cm	12,200	13,000	12,750	13,000	15,000
Fecal Coli. MPN/100 ml	< 3	9.2			
Fecal Strep. MPN/100 ml	240	2300			
Iron				180	185
Lead		0.5		0.18	0.35
Magnesium	360	420	420	500	656
Mercury		0.0052		0.0090	
Nitrogen - Ammonia	720	880	592	560	612
Nitrogen - Organic	332	864	440	142	151
Nitrogen - Nitrate	3.1	3.0	6.34	0.16	
Phosphate-Total, as P	32.0	27.7	28.1	12.4	
P.C.B. ppb	0				
Potassium		760		800	830
Sodium		950		880	944
Solids - T.D.S.	17,970	14,610	17,450	21,220	18,460
Solids - T.S.S.	40	50	34	75	97
Solids - Settle. ml/l	0.1	0.6			
Sulphate		908			
Temperature ** (°C)	18.5	20.0	21.0	23.5	23.5
Volatile Acids	11,400	11,300		10,750	
Zinc		30		28	28
pH	5.2	5.1	5.2	5.2	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-9C

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 8-8-72	8-23-72	9-7-72	9-20-72	10-11-72
Alkalinity	7700	6000	7900	8000	3430
B.O.D.	24,300	21,550	21,800	22,500	25,800
Cadmium	< 0.1		<0.1		< 0.1
Calcium	1440	1400	1380	1430	1402
C.O.D.	28,610	34,320	33,660	35,550	36,700
Chloride	1080	1070	1080	1250	1159
Color (Color Units)		250	250	290	290
Copper	0.14		0.15		0.25
Dissolved Oxygen ppm	0.3	0.4	0.1	0.8	0.0
Elect. Cond. μ mhos/cm	14,500	15,200	13,000	14,000	14,000
Fecal Coli. MPN/100 ml	3		9.2		< 3
Fecal Strep. MPN/100 ml	<3		< 3		<3
Iron	175		165		208
Lead	0.64		0.36		0.59
Magnesium	510	535	495	545	568
Mercury	0.012		0.064		.0055
Nitrogen - Ammonia	570	638	604	596	702
Nitrogen - Organic	149	156	161	167	190
Nitrogen - Nitrate	0.08	2.6	0.2	0.2	0
Phosphate-Total, as P	10.0	23.0	16.0	15.0	8.0
P.C.B. ppb			0		
Potassium	780		740		750
Sodium	1010		888		960
Solids - T.D.S.	18,740	20,540	18,900	20,200	19,540
Solids - T.S.S.	420	264	480	102	370
Solids - Settle. ml/l			< 0.05		
Sulphate			600		
Temperature ** (°C)	23.5	25.0	25.0	22.0	18.0
Volatile Acids	12,750		12,500		13,600
Zinc			21.5		29.5
pH	5.3	5.1	5.1	5.0	5.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-9D

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 10-24-72	11-8-72	11-21-72	11-30-72	12-19-72
Alkalinity	4500	4900	4600	4700	4214
B.O.D.	25,200	25,800	25,200	27,250	26,200
Cadmium	0.16	0.09	0.04	0.05	< 0.1
Calcium	1380	1330	1440	1354	1402
C.O.D.	34,840	33,260	34,340	34,300	27,250
Chloride	1200	1100	1520	1560	1565
Color (Color Units)	370	375	225	260	275
Copper	0.10	0.35	0.32	0.11	0.07
Dissolved Oxygen ppm	0.4	0.2	0.05	0.15	0.2
Elect. Cond. μ mhos/cm	15,500	10,000	9000	12,000	9750
Fecal Coli. MPN/100 ml		< 3		< 3	
Fecal Strep. MPN/100 ml		< 3		3	
Iron	185	185	180	200	
Lead	0.47	0.32	0.37	0.55	
Magnesium	508	560	630	580	
Mercury		0.0022		0.0045	
Nitrogen - Ammonia	630	556	561	580	522
Nitrogen - Organic	180	146	137	134	101
Nitrogen - Nitrate	0.1	0.0	0.0	0.05	0.4
Phosphate-Total, as P	4.0	11.0	3.0	4.4	1.8
P.C.B. ppb				0	
Potassium	800	760	730	690	584
Sodium	1010	910	800	880	848
Solids - T.D.S.	17,000	17,000	17,400	17,380	14,980
Solids - T.S.S.	80	600	600	412	90
Solids - Settle. ml/l				0	
Sulphate				467	
Temperature ** (°C)	23.0	20.5	17.0	14.0	13.0
Volatile Acids	12,600	11,200	12,400	12,800	
Zinc	28.5	27.5	25.0	11.5	21.5
pH	5.0	5.1	5.2	5.2	5.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-9E

LEACHATE ANALYSIS
CELL D

COMPONENT *	SAMPLE DATE 1-10-73	1-23-73	2-6-73	2-27-73	3-13-73
Alkalinity	4410	4214	4620	1680	4935
B.O.D.	26,100	25,700	18,200	21,400	20,800
Cadmium	<0.1	<0.1	<0.1	< 0.05	<0.05
Calcium	1426	962	561	1322	1400
C.O.D.	30,100	31,200	31,600	29,800	29,700
Chloride	1174	1062	1129	1225	1320
Color (Color Units)	150	100	75	175	150
Copper	0.29	0.08	0.11	0.12	0.09
Dissolved Oxygen ppm	0.4	0.2	0.7***	0.4	0.5
Elect. Cond. μ mhos/cm	12,250	8,600	6750	7000	7000
Fecal Coli. MPN/100 ml	6		< 3.0		
Fecal Strep. MPN/100 ml	3		3.0		
Iron	200	230	212	300	255
Lead	0.43	0.40	0.23	0.46	0.24
Magnesium	560	552	576	636	388
Mercury	0.0086	0.0108	0.0160	0.0123	0.0047
Nitrogen - Ammonia	474	513	498	500	480
Nitrogen - Organic	95	119	107	128	90
Nitrogen - Nitrate	0.50	0.08	0.18	0.36	0.1
Phosphate-Total, as P	8.0	8.0	5.6	2.2	1.8
P.C.B. ppb					0
Potassium	656	740	740	640	610
Sodium	872	896	928	948	888
Solids - T.D.S.	16,900	16,440	16,720	16,360	16,880
Solids - T.S.S.	72	22	28	66	72
Solids - Settle. ml/l					
Sulphate					440
Temperature ** (°C)	12.0	13.0	13.0	13.0	14.0
Volatile Acids	11,800		12,200		12,100
Zinc	21.0	22.5	17.8	17.6	16.9
pH	5.1	5.3	4.8	5.5	5.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.
*** Questionable Result

Plate H-9F

LEACHATE ANALYSIS
CELL D

	SAMPLE DATE				
COMPONENT *	3-27-73	4-10-73	4-24-73	5-15-73	6-5-73
Alkalinity	5460	4410	4935	4515	4200
B.O.D.	21,400	24,200	24,100	16,100	15,800
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium	1386	1386	1600	1218	1080
C.O.D.	29,500	29,100	28,500	24,450	22,700
Chloride	1380	1115	1160	1450	1565
Color (Color Units)	150	100	125		
Copper	0.12	0.08	0.06	0.04	0.10
Dissolved Oxygen ppm	0.3	0.3	0.8	0.5	0.4
Elect. Cond. µ mhos/cm	6000	6000	6000	4800	6000
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	248	275	290	240	215
Lead		<0.1	0.50	0	0
Magnesium	612	556	604	672	528
Mercury		0.0008	0.0030	0	
Nitrogen - Ammonia	516	519	563	290	543
Nitrogen - Organic	90	61	77	34	74
Nitrogen - Nitrate	0.24		0.48	1.12	0.3
Phosphate-Total, as P	6.8	1.4	3.4	4.0	2.4
P.C.B. ppb					
Potassium	680	610	640	280	
Sodium	904	880	856	880	
Solids - T.D.S.	17,680	17,280	16,970	15,600	14,800
Solids - T.S.S.	50	52	68	32	
Solids - Settle. ml/l					
Sulphate				316	
Temperature ** (°C)	14.0	17.0	17.0	18.7	19.5
Volatile Acids		12,300		9900	
Zinc	17.5	14.0	15.0	12.0	7.6
pH	5.3	5.3	5.4	4.9	5.5

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-9G

LEACHATE ANALYSIS
CELL D

	SAMPLE DATE				
COMPONENT *	6-26-73				
Alkalinity	4410				
B.O.D.	15,500				
Cadmium	<0.05				
Calcium	946				
C.O.D.	21,600				
Chloride	1145				
Color (Color Units)					
Copper	0.08				
Dissolved Oxygen ppm	0.40				
Elect. Cond. µ mhos/cm	5600				
Fecal Coli. MPN/100 ml	20.0				
Fecal Strep. MPN/100 ml	7.0				
Iron	203				
Lead	0.31				
Magnesium	316				
Mercury	0				
Nitrogen - Ammonia	551				
Nitrogen - Organic	68				
Nitrogen - Nitrate	1.60				
Phosphate-Total, as P	4.4				
P.C.B. ppb					
Potassium	260				
Sodium	408				
Solids - T.D.S.	14,600				
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	257				
Temperature ** (°C)	24.5				
Volatile Acids	9540				
Zinc	8.5				
pH	5.8				

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-9H

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 12-15-71	12-21-71	1-3-72	1-11-72	1-18-72
Alkalinity ($CaCO_3$)			704		626
B.O.D.			1,730		1,020
Cadmium			<0.25		
Calcium			200		170
C.O.D.			1,986		1,430
Chloride			210		170
Color (Color Units)					450
Copper			0.45		
Dissolved Oxygen ppm		2.4	1.6	0.8	1.6
Elect. Cond. µ mhos/cm		3,200		2,200	2,000
Fecal Coli. MPN/100 ml			9		240
Fecal Strep. MPN/100 ml			400		24,000
Iron					
Lead			<2.0		
Magnesium			150		1.[illegible]
Mercury			0.004		
Nitrogen - Ammonia			11.6		4.40
Nitrogen - Organic			350		55[illegible]
Nitrogen - Nitrate			1.0		0.87
Phosphate-Total, as P			0.35		2.3
P.C.B. ppb				0	
Potassium			24		
Sodium			115		
Solids - T.D.S.			2,948		2,186
Solids - T.S.S.			60		10.0
Solids - Settle. ml/l			<0.1		0.1
Sulphate					
Temperature** (°C)			13.0	8.0	8.0
Volatile Acids			480		
Zinc			0.15		
pH	6.5	6.5	5.8		6.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-10A

LEACHATE ANALYSIS
CELL E

COMPONENT *	SAMPLE DATE 2-15-72	3-2-72	3-14-72	10-24-72	11-30-72
Alkalinity	620		550	3720	3040
B.O.D.	480			16,800	25,250
Cadmium		<0.1		0.09	0.06
Calcium	130			1060	1080
C.O.D.	216		2580	24,450	33,300
Chloride	102		300	750	950
Color (Color Units)	420		600	440	375
Copper	<0.2			0.12	0.08
Dissolved Oxygen ppm	1.1		6.6	0.6	0.4
Elect. Cond. µ mhos/cm	1400			7000	9000
Fecal Coli. MPN/100 ml				6.1	<3
Fecal Strep. MPN/100 ml				24,000	<3
Iron				453	483
Lead	<0.5			0.60	0.32
Magnesium	100			736	544
Mercury	0.0005			0.0145	0.0050
Nitrogen - Ammonia	6.1		5.6	220	382
Nitrogen - Organic	13.2		27.0	140	132
Nitrogen - Nitrate	0.6		0.8	0.3	0
Phosphate-Total, as P	2.6		3.0	3.0	3.2
P.C.B. ppb				0	
Potassium	8.4		25	340	610
Sodium	71		120	364	656
Solids - T.D.S.	1212		2800	13,200	15,400
Solids - T.S.S.	54		240	940	420
Solids - Settle. ml/l			~1		
Sulphate	0.0		0.0	300	456
Temperature** (°C)	18.0		22.5	20.0	6.5
Volatile Acids	552		430		11,800
Zinc	<0.1			1.67	6.5
pH	5.7		6.5	5.2	4.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-10B

LEACHATE ANALYSIS

CELL E

COMPONENT *	SAMPLE DATE				
	1-23-73	3-13-73	4-24-73	6-5-73	6-26-73
Alkalinity	4700	11,025	8910	5250	8925
B.O.D.	33,200	40,000	50,500	42,800	47,300
Cadmium	<0.1	<0.05	<0.05	<0.05	<0.05
Calcium	1360	1844	2160	2600	2605
C.O.D.	41,700	58,100	51,900	62,000	65,600
Chloride	823	1565	1760	1565	1830
Color (Color Units)	175	425	375		
Copper	0.1	0.19	0.32	0.10	0.10
Dissolved Oxygen ppm	0.3	0.6	0.6	0.4	0.20
Elect. Cond. µ mhos/cm	9000	9500	8000	20,000	9800
Fecal Coli. MPN/100 ml	< 3.0	< 3.0	3.0		< 3.0
Fecal Strep. MPN/100 ml	3.0	< 3.0	< 3.0		< 3.0
Iron	370	478	520	525	500
Lead	0.60	0.45	0.21	0.42	0.73
Magnesium	536	676	896	896	956
Mercury	0.0112	0.0044	0		0
Nitrogen - Ammonia	602	690	895	946	946
Nitrogen - Organic	248	35	483	531	560
Nitrogen - Nitrate	0	0	0.40	0	0.48
Phosphate-Total, as P	6.4	5.6	10.0	16.0	3.6
P.C.B. ppb		0			
Potassium	1040	1400	1430	1320	1470
Sodium	880	1110	1216	1264	1344
Solids - T.D.S.	18,420	26,680	31,680	30,000	35,240
Solids - T.S.S.	60	164	80		
Solids - Settle. ml/l					
Sulphate		958			1106
Temperature** ($^{\circ}$C)	8.0	14.0	17.0	19.0	29.0
Volatile Acids	13,900	18,100	19,200		19,560
Zinc	41.0	56.4	64.0	58	61
pH	5.1	4.8	5.2	5.2	5.3

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-10C

WATER ANALYSIS
WATER ADDED TO CELL C

	SAMPLE DATE				
COMPONENT *	12-28-71	3-2-72	3-14-72	4-11-72	4-25-72
Alkalinity ($CaCO_3$)	0.0				304
B.O.D.	1.0				3.0
Cadmium					<0.1
Calcium	36				20
C.O.D.	850				0
Chloride	73				70
Color (Color Units)	5				0
Copper					<0.25
Dissolved Oxygen ppm	7.6	8.8	9.2	8.9	7.9
Elect. Cond. µ mhos/cm	750	650	700	750	800
Fecal Coli. MPN/100 ml	<3				<3
Fecal Strep. MPN/100 ml	---				11,000
Iron					
Lead					<1.0
Magnesium	36				25
Mercury					0.026
Nitrogen - Ammonia	0.1				0.17
Nitrogen - Organic	0.00				0.60
Nitrogen - Nitrate	0.10				0.24
Phosphate-Total, as P					0.29
P.C.B. ppb	0				0
Potassium					7.3
Sodium					114
Solids - T.D.S.	502				476
Solids - T.S.S.	1.0				0
Solids - Settle. ml/l	NIL				0
Sulphate					78
Temperature** (°C)		15.0	18.0	14.0	18.5
Volatile Acids	432				0
Zinc					<0.05
pH	7.2	7.8	7.6		7.7

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-11A

WATER ANALYSIS
WATER ADDED TO CELL C

	SAMPLE DATE				
COMPONENT *	5-9-72	5-23-72	6-6-72	6-20-72	7-11-72
Alkalinity					
B.O.D.					
Cadmium					
Calcium					
C.O.D.					
Chloride					
Color (Color Units)					
Copper					
Dissolved Oxygen ppm	9.8	7.0	7.2	7.0	7.3
Elect. Cond. µ mhos/cm	600	750	675	900	800
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron					
Lead					
Magnesium					
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.					
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate					
Temperature** (°C)	19.0	21.0		19.0	24.0
Volatile Acids					
Zinc					
pH	7.5	7.7	7.8	7.9	7.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-11B

WATER ANALYSIS
WATER ADDED TO CELL C

COMPONENT *	SAMPLE DATE				
	7-25-72	8-8-72	9-7-72	10-11-72	11-8-72
Alkalinity	330				
B.O.D.	0				
Cadmium	0				
Calcium	22				
C.O.D.	12				
Chloride	57				
Color (Color Units)					
Copper	0.07				
Dissolved Oxygen ppm	6.4	7.4	7.0	8.0	9.4
Elect. Cond. µ mhos/cm	800	800	825	800	950
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron	0.5				
Lead	0.15				
Magnesium	16				
Mercury	0.0102				
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	7.9				
Sodium	152				
Solids - T.D.S.	536				
Solids - T.S.S.	<0.5				
Solids - Settle. ml/l					
Sulphate	32				
Temperature** (°C)	23.5	19.5	23.5	16.0	14.5
Volatile Acids	0				
Zinc	0.09			1	
pH	7.3	7.8	7.9	8.0	8.0

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-11C

WATER ANALYSIS
WATER ADDED TO CELL C

COMPONENT *	SAMPLE DATE				
	11-30-72	1-10-73	2-6-73	3-27-73	6-26-73
Alkalinity	304			292	286
B.O.D.	<2				
Cadmium	0			0	0
Calcium	43			28	26
C.O.D.	2			0	4.0
Chloride	56			50	49
Color (Color Units)	4				
Copper	0.04			0.06	0
Dissolved Oxygen ppm	9.0	9.4	8.6	8.8	6.3
Elect. Cond. µ mhos/cm	850	700	650	800	980
Fecal Coli. MPN/100 ml	<3				<3.0
Fecal Strep. MPN/100 ml	4				<3.0
Iron	0.3			0.20	0.2
Lead	0			0	0
Magnesium	11			29	17
Mercury	0.0105			0	0.0002
Nitrogen - Ammonia	0				0
Nitrogen - Organic	0				0
Nitrogen - Nitrate	0.23				0.56
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium	5.7			8.7	8.5
Sodium	132			124	24
Solids - T.D.S.	440			480	1040
Solids - T.S.S.				0	
Solids - Settle. ml/l					
Sulphate	25			38	97
Temperature** (°C)	10	9	12.5	14.0	30.1
Volatile Acids					
Zinc	0.03			0.07	0.06
pH	8.0	7.6	7.4	7.7	7.95

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-11D

GROUNDWATER ANALYSIS

WELL 1

COMPONENT *	SAMPLE DATE 1-3-72	1-18-72	3-2-72	3-14-72	3-28-72
Temperature** (°C)	15.0	11.0	15.5	23.0	15.5
Alkalinity ($CaCO_3$)		202	88	184	124
B.O.D.		31	3		
Cadmium		<0.05	<0.1		
Calcium		78	10		
C.O.D.		8.58	120		
Color (Color Units)					
Copper		<0.2	<0.2		
Chloride		60	27	60	53
Dissolved Oxygen ppm	8.3	6.8	5.8	5.4	6.4
Elect.Cond. μ mhos/cm		750	260	400	430
Fecal Coli. MPN/100 ml		15	2400		
Fecal Strep. MPN/100 ml					
Lead		<0.5	<0.5		
Magnesium		40	43		
Mercury		0.0003	0.0004		
Nitrogen - Ammonia		0.160	0.084		
Nitrogen - Organic					
Nitrogen - Nitrate		0.30	1.07		
Nitrogen - Nitrite		0.013			
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium		2.35	3.15		
Sodium		96.0	50		
Solids - T.D.S.		636	716	508	452
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc		0.9	1.2		
pH	7.3	7.3	7.1	7.3	7.1
Sulphate			9.2		

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Plate H-12A

GROUNDWATER ANALYSIS

WELL 1

COMPONENT *	SAMPLE DATE 4-11-72	4-25-72	5-9-72	5-23-72	6-6-72
Temperature** (°C)	17.5	16.0	20.0	18.0	17.0
Alkalinity ($CaCO_3$)	121	122	136	134	132
B.O.D.	2		2		
Cadmium	< 0.1		< 0.1		
Calcium	11		12		
C.O.D.	16		23		38
Color (Color Units)					
Copper	< 0.25		<0.2		
Chloride	58.5	60	51	54	62
Dissolved Oxygen ppm	5.8	6.5	4.0	4.3	4.2
Elect.Cond. μ mhos/cm	400	410	450	450	475
Fecal Coli. MPN/100 ml	23		460		4
Fecal Strep. MPN/100 ml					
Lead	< 1.0		<1.0		
Magnesium	45		20		
Mercury	0.0050		0.0047		
Nitrogen - Ammonia	0		0.149		0.096
Nitrogen - Organic					
Nitrogen - Nitrate	0.74		0.50		0.12
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	3.1		5.9		4.9
Sodium	64.8		75		78
Solids - T.D.S.	486	470	296	482	272
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.1		0.1		
pH		7.1	7.4	7.3	7.0
Sulphate					

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Plate H-12B

GROUNDWATER ANALYSIS
WELL 1

	SAMPLE DATE				
COMPONENT *	7-11-72	7-25-72	8-8-72	9-7-72	10-11-72
Alkalinity		200		160	
B.O.D.					
Cadmium		0		0	
Calcium		19		10	
C.O.D.				3	
Chloride				59	
Color (Color Units)					
Copper		<0.02		0	
Dissolved Oxygen ppm	2.9	4.2	4.2	8.3	4.8
Elect. Cond. µ mhos/cm	520	525	500	500	530
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron		0		4.9	
Lead		0		0	
Magnesium		6		17	
Mercury		0.0075		0.0047	
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium		2.4		2.0	
Sodium		78		98	
Solids - T.D.S.				366	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate				19	
Temperature** (°C)	22.5	22.0	21.0	22.0	19.0
Volatile Acids					
Zinc		<0.05		0.08	
pH	7.3	7.4	7.3	7.2	7.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-12C

GROUNDWATER ANALYSIS
WELL 1

	SAMPLE DATE				
COMPONENT *	11-8-72	11-30-72	12-19-72	1-10-73	2-6-73
Alkalinity		140			
B.O.D.		<2			
Cadmium		0			
Calcium		16			
C.O.D.		2			
Chloride		108			
Color (Color Units)					
Copper		0.05			
Dissolved Oxygen ppm	4.8	6.3		9.2	7.4
Elect. Cond. µ mhos/cm	500	600		850	320
Fecal Coli. MPN/100 ml		150			
Fecal Strep. MPN/100 ml		460			
Iron		12.9			
Lead		0			
Magnesium		12			
Mercury		0			
Nitrogen - Ammonia		0			
Nitrogen - Organic					
Nitrogen - Nitrate		0.95			
Phosphate-Total, as P					
P.C.B. ppb			0		
Potassium		1.5			
Sodium		70			
Solids - T.D.S.		560			
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate		73			
Temperature** (°C)	19.0	15.0		13.0	12.5
Volatile Acids					
Zinc		0.4			
pH	7.3	7.4		7.2	6.9

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-12D

GROUNDWATER ANALYSIS

WELL 1

	SAMPLE DATE				
COMPONENT *	3-13-73	6-26-73			
Alkalinity	98	130			
B.O.D.					
Cadmium	0	0			
Calcium	14	14			
C.O.D.	3	9.6			
Chloride	73	50			
Color (Color Units)					
Copper	0.08	0.06			
Dissolved Oxygen ppm	12.2	2.6			
Elect. Cond. µ mhos/cm	380	675			
Fecal Coli. MPN/100 ml		< 3.0			
Fecal Strep. MPN/100 ml		4.0			
Iron	28	27			
Lead	0	0			
Magnesium	18	19			
Mercury	0	0.0004			
Nitrogen - Ammonia		0.1			
Nitrogen - Organic		1.3			
Nitrogen - Nitrate		0.8			
Phosphate-Total, as P					
P.C.B. ppb					
Potassium	2.9	4.0			
Sodium	59	73			
Solids - T.D.S.	600	960			
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	72	30			
Temperature** (°C)	14.5	35.0			
Volatile Acids					
Zinc	0.11	0.76			
pH	7.1	7.15			

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-12E

GROUNDWATER ANALYSIS

WELL 2

	SAMPLE DATE				
COMPONENT *	1-18-72	3-14-72	3-28-72	4-11-72	4-25-72
Alkalinity ($CaCO_3$)	158	142	132	132	140
B.O.D.	1	2		1	
Cadmium	< 0.05	0.1		< 0.1	
Calcium	8.3	21		11	
C.O.D.	0	5.6		11.0	
Color (Color Units)					
Copper	2.0	.01		< 0.25	
Chloride	25	26	31	19.7	33
Dissolved Oxygen ppm	5.2	6.3	4.7	6.6	6.1
Elect.Cond. μ mhos/cm	400	340	350	320	320
Fecal Coli. MPN/100 ml	3	< 3		< 3	
Fecal Strep.MPN/100 ml					
Lead	< 0.5	<1.0		< 1.0	
Magnesium	40	21		30	
Mercury	.0004	.0009		.00019	
Nitrogen - Ammonia	.016	.096		0.0	
Nitrogen - Organic					
Nitrogen - Nitrate	.38	0.1			0.0
Nitrogen - Nitrite	.003				
Phosphate (total)					
P.C.B. ppb					
Potassium	2.12	11		1.4	
Sodium	38	27		26.2	
Solids - T.D.S.	1372	286	218	272	208
Solids - T.S.S.					
Solids - Settle. ml/1					
Volatile Acids					
Zinc	0.8	0.3		< 0.1	
pH	7.15	7.2	7.0		7.1
Sulfate					

* Units in mg/l unless noted

Plate H-13A

GROUNDWATER ANALYSIS

WELL 2

	SAMPLE DATE				
COMPONENT *	5-9-72	5-23-72	6-6-72	7-11-72	7-25-72
Temperature** (°C)	18.0	20.0	19.0	19.0	23.0
Alkalinity ($CaCO_3$)	136	136	130		
B.O.D.			9		
Cadmium	< 0.1		0.12		
Calcium	21		1.5		
C.O.D.	12		22		
Color (Color Units)					
Copper	< 0.2		0.2		
Chloride	23	21	30		
Dissolved Oxygen ppm	6.0	3.8	7.5	4.5	6.2
Elect.Cond. μ mhos/cm	330	360	430	360	400
Fecal Coli. MPN/100 ml	7		< 3		
Fecal Strep. MPN/100 ml					
Lead	< 1.0		0.15		
Magnesium	30		29		
Mercury	0.0062		0.0057		
Nitrogen - Ammonia	0.112		0.160		
Nitrogen - Organic					
Nitrogen - Nitrate	0.09		0.05		
Nitrogen - Nitrite					
Phosphate -Total, as P					
P.C.B. ppb					0
Potassium	1.4		2.1		
Sodium	30		20.5		
Solids - T.D.S.	198	228	158		
Solids - T.S.S.					
Solids - Settle. ml/1					
Volatile Acids					
Zinc	0.1		0.14		
pH	7.3	7.1	7.0	7.0	7.6
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC and pH.

Plate H-13B

GROUNDWATER ANALYSIS
WELL 2

COMPONENT *	SAMPLE DATE 8-8-72	9-7-72	10-11-72	11-8-72	11-30-72
Alkalinity		155			150
B.O.D.					<1
Cadmium		0			0
Calcium		20			58
C.O.D.		0			1
Chloride		20			10
Color (Color Units)					
Copper		0			0.03
Dissolved Oxygen ppm	6.1	5.0	4.2	5.2	7.4
Elect. Cond. µ mhos/cm	360	380	370	450	360
Fecal Coli. MPN/100 ml					<3
Fecal Strep. MPN/100 ml					4.0
Iron		0.4			0.7
Lead		0			0
Magnesium		24			16
Mercury		0.0025			0.0060
Nitrogen - Ammonia					0
Nitrogen - Organic					0
Nitrogen - Nitrate					0.25
Phosphate-Total, as P					
P.C.B. ppb					
Potassium		1.45			0.7
Sodium		44			38
Solids - T.D.S.		212			238
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate		10			8
Temperature** (°C)	20.0	22.5	18.5	19.5	14.0
Volatile Acids					
Zinc		0.08			0.04
pH	7.3	7.1	7.0	7.3	7.4

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-13C

GROUNDWATER ANALYSIS
WELL 2

COMPONENT *	SAMPLE DATE 12-19-72	1-10-73	2-6-73	3-13-73	6-26-73
Alkalinity				134	155
B.O.D.					
Cadmium				0	0
Calcium				32	19
C.O.D.				1	10.4
Chloride				48	18
Color (Color Units)					
Copper				0.05	0
Dissolved Oxygen ppm		5.6	6.4	11.5	6.4
Elect. Cond. µ mhos/cm		360	310	450	260
Fecal Coli. MPN/100 ml					3.0
Fecal Strep. MPN/100 ml					4600
Iron				0.3	1.6
Lead				0	0
Magnesium				15	22
Mercury				.0080	0.0004
Nitrogen - Ammonia					0.3
Nitrogen - Organic					1.1
Nitrogen - Nitrate					0.64
Phosphate-Total, as P					
P.C.B. ppb	0.2				
Potassium				1.0	1.4
Sodium				28	34
Solids - T.D.S.				160	840
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate				10	8
Temperature** (°C)		12.0	12.0	15.0	35.6
Volatile Acids					
Zinc				0.04	0.16
pH		7.2	6.7	7.3	7.1

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-13D

GROUNDWATER ANALYSIS

WELL 3

COMPONENT *	SAMPLE DATE 1-18-72	3-2-72	3-14-72	3-28-72	4-11-72
Temperature ** (°C)	12.0	15.0	20.5	16.0	17.0
Alkalinity ($CaCO_3$)	118	78	116	112	118
B.O.D.	9	2			2
Cadmium	< 0.05	< 0.1			< 0.1
Calcium	40	26			21
C.O.D.	0	126			5
Color (Color Units)					
Copper	< 0.2	< 0.2			< 0.25
Chloride	13	10	43	24	13.3
Dissolved Oxygen ppm	6.0	6.6	5.0	6.8	6.4
Elect.Cond. µ mhos/cm	350	250	330	320	300
Fecal Coli. MPN/100 ml	4	930			< 3
Fecal Strep. MPN/100 ml					
Lead	< 0.5	< 0.5			< 1.0
Magnesium	30	20			17
Mercury	0.0004	0.0012			0.0015
Nitrogen - Ammonia	0.016	0.048			0.04
Nitrogen - Organic					
Nitrogen - Nitrate	2.25	2.00			2.19
Nitrogen - Nitrite	0.003				
Phosphate - Total, as P					
P.C.B. ppb	0				
Potassium	1.88	1.9			1.7
Sodium	14.5	14.0			13.5
Solids - T.D.S.	276	304	108	214	672
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.3	.05			< 0.1
pH	7.4	7.2	7.2	7.1	
Sulphate		17.2			

* Units in mg/l unless noted

** Temperature of sample when tested for DO, EC, and pH.

Plate H-14 A

GROUNDWATER ANALYSIS

WELL 3

COMPONENT *	SAMPLE DATE 4-25-72	5-9-72	5-23-72	6-6-72	7-11-72
Temperature ** (°C)	16.0	19.5	19.0	18.0	22.5
Alkalinity ($CaCO_3$)	122	146	106	102	
B.O.D.		2		5	
Cadmium		< 0.1		0.15	
Calcium		24		2.1	
C.O.D.		331		38	
Color (Color Units)					
Copper		< 0.2		0.25	
Chloride	31	13	12	19	
Dissolved Oxygen ppm	6.3	7.2	3.9	6.2	6.2
Elect.Cond. µ mhos/cm	320	300	300	300	310
Fecal Coli MPN/100 ml		460		43	
Fecal Strep. MPN/100 ml					
Lead		< 1.0		0.20	
Magnesium		20		54	
Mercury		0.0048		0.0027	
Nitrogen - Ammonia		0.088		0	
Nitrogen - Organic					
Nitrogen - Nitrate		1.52		2.60	
Nitrogen - Nitrite					
Phosphate - Total, as P					
P.C.B. ppb					
Potassium		1.5		2.6	
Sodium		15		13.8	
Solids - T.D.S.	202	366	214	278	
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc		0.1		0.22	
pH	7.2	7.3	7.1	7.2	7.1
Sulphate					

* Units in mg/l unless noted

** Temperature of sample when tested for DO, EC, and pH.

Plate H-14B

GROUNDWATER ANALYSIS
WELL 3

COMPONENT *	SAMPLE DATE 7-25-72	8-8-72	9-7-72	10-11-72	11-8-72
Alkalinity			120		
B.O.D.					
Cadmium			0		
Calcium			30		
C.O.D.			0		
Chloride			10		
Color (Color Units)					
Copper			0		
Dissolved Oxygen ppm	6.2	6.7	4.6	4.7	5.0
Elect. Cond. µ mhos/cm	400	300	300	310	350
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Iron			0.6		
Lead			0		
Magnesium			19		
Mercury			0.0025		
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium			1.55		
Sodium			33		
Solids - T.D.S.			178		
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate			15		
Temperature** (°C)	22.0	20.0	22.0	19.0	20.0
Volatile Acids					
Zinc			0.06		
pH	7.5	7.4	7.1	7.2	7.2

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-14C

GROUNDWATER ANALYSIS
WELL 3

COMPONENT *	SAMPLE DATE 11-30-72	12-19-72	1-10-73	2-6-73	3-13-73
Alkalinity	110				150
B.O.D.	<1				
Cadmium	0				0
Calcium	50				40
C.O.D.	1				0
Chloride	24				29
Color (Color Units)					
Copper	0.03				0.05
Dissolved Oxygen ppm	7.6		7.4	4.8	11.2
Elect. Cond. µ mhos/cm	300		350	360	350
Fecal Coli. MPN/100 ml	23.0				
Fecal Strep. MPN/100 ml	93.0				
Iron	0.4				0.2
Lead	0				0
Magnesium	15				25
Mercury	0.0058				0
Nitrogen - Ammonia	0				
Nitrogen - Organic	0				
Nitrogen - Nitrate	4.50				
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium	0.5				0.8
Sodium	20				32
Solids - T.D.S.	210				160
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	18				27
Temperature** (°C)	14.0		12.0	12.0	15.0
Volatile Acids					
Zinc	0.04				0.07
pH	7.2		7.2	6.7	7.3

* Units in mg/l unless noted.
** Temperature of sample when tested for DO, EC and pH.

Plate H-14D

GROUNDWATER ANALYSIS

WELL 4

COMPONENT *	SAMPLE DATE 1-18-72	3-14-72	3-28-72	4-11-72	4-25-72
Temperature ** (°C)	12.0	19.5	18.0	16.0	17.0
Alkalinity ($CaCO_3$)	106	118	114	122	132
B.O.D.	10	3		2	
Cadmium	< 0.05	< 0.1		< 0.1	
Calcium	200	30		20	
C.O.D.	0	28		11	
Color (Color Units)					
Copper	1.2	<.01		< 0.25	
Chloride	27	30	24	16.7	28
Dissolved Oxygen ppm	5.5	6.0	4.3	5.9	4.8
Elect.Cond. μ mhos/cm	300	320	300	300	250
Fecal Coli. MPN/100 ml	43	< 3		< 3	
Fecal Strep. MPN/100 ml					
Lead	< 0.5	<1.0		< 1.0	
Magnesium	300	30		35	
Mercury	0.0006	0.0012		0.0033	
Nitrogen - Ammonia	0 16	0.232		0.0	
Nitrogen - Organic					
Nitrogen - Nitrate	0.08	0.3		0.0	
Nitrogen - Nitrite	0.010				
Phosphate-Total, as P					
P.C.B. ppb	0				
Potassium	2.10	14		1.9	
Sodium	13.0	16.5		16.6	
Solids - T.D.S.	240	262	214	404	248
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.2	1.1		< 0.1	
pH	6.8	6.7	6.4		6.6
Sulphate					

* Units in mg/l unless noted

** Temperature of sample when tested for DO, EC, and pH

Plate H-15 A

GROUNDWATER ANALYSIS

WELL 4

COMPONENT *	SAMPLE DATE 5-9-72	5-23-72	6-6-72	7-11-72	7-25-72
Temperature ** (°C)	19.0	18.0		21.0	19.0
Alkalinity ($CaCO_3$)	140	120	118		
B.O.D.	2		7		
Cadmium	< 0.1		0.18		
Calcium	25		2.8		
C.O.D.	12		38		
Color (Color Units)					
Copper	< 0.2		0.55		
Chloride	25	15	22		
Dissolved Oxygen ppm	5.0	4.0	3.2	5.5	4.0
Elect.Cond. μ mhos/cm		300	310	240	400
Fecal Coli. MPN/100 ml	9		< 3		
Fecal Strep.MPN/100 ml					
Lead	< 1.0		0.20		
Magnesium			90		
Mercury	0.027		0.0090		
Nitrogen - Ammonia	0.112		0.208		
Nitrogen - Organic					
Nitrogen - Nitrate	0.16		0.33		
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					0
Potassium	1.9		2.6		
Sodium	24		18		
Solids - T.D.S.	202	256	328		
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc	0.2		0.34		
pH	6.6	6.7	6.8	6.9	7.3
Sulphate					

* Units in mg/l unless noted

** Temperature of sample when tested for DO, EC and pH.

Plate H-15B

GROUNDWATER ANALYSIS

WELL 4

	SAMPLE DATE				
COMPONENT *	8-8-72	9-7-72	12-19-72	3-27-73	
Alkalinity		135	130	100	
B.O.D.			0		
Cadmium		0	<0.1	0	
Calcium		32	26	32	
C.O.D.		0	0	1	
Chloride		10	22	13	
Color (Color Units)					
Copper		0	0.02	0.06	
Dissolved Oxygen ppm	6.0	5.0	4.4	5.6	
Elect. Cond. µ mhos/cm	310	300	330	380	
Fecal Coli. MPN/100 ml			<3.0		
Fecal Strep. MPN/100 ml			43.0		
Iron		1.1	1.8	1.65	
Lead		0	0	0	
Magnesium		15	17.5	21	
Mercury		0.0037	0.0088	0.0016	
Nitrogen - Ammonia			0		
Nitrogen - Organic			0		
Nitrogen - Nitrate			0.1		
Phosphate-Total, as P					
P.C.B. ppb			0		
Potassium		1.60	1.16	1.2	
Sodium		28	28	17.5	
Solids - T.D.S.		186	288	280	
Solids - T.S.S.			23		
Solids - Settle. ml/l					
Sulphate		18	73	35	
Temperature** (°C)	18.0	22.0	16.0	17.5	
Volatile Acids					
Zinc		0.04	0.06	0.05	
pH	6.6	6.6	6.9	6.4	

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-15C

WATER ANALYSIS REPORT

COOK RESEARCH LABORATORIES INC

PH. (415) 368-3329
EDISON WAY AT 11TH AVENUE

WATER, WASTE WATER AND AIR POLLUTION
CHEMISTS AND ENGINEERS

ESTABLISHED 1927

P. O. BOX 2266
MENLO PARK, CALIF. 94025

LABORATORY FACILITIES FOR ALL
"STANDARD METHODS" TESTS

REPORT TO
- Terratech, Inc.
- 193 E. Gish Road
- San Jose, California 95112

SOURCE OF SAMPLE Hammel
DATE REC'D 5/25
DATE REPORTED 6/2/70

ANIONS	MILLIGRAMS PER LITER	EQUIVALENTS PER MILLION	DETERMINATION	MILLIGRAMS PER LITER	DETERMINATION	MILLIGRAMS PER LITER
Nitrate (NO_3)	2.8	0.04	Phenolphthalein Alkalinity ($CaCO_3$)	0.0	Silica (SiO_2)	20
Chloride (Cl)	38.	1.07	Methyl Orange Alkalinity ($CaCO_3$)	148	Iron (Fe)	0.77
Sulphate (SO_4)	11.	0.23	Total Hardness ($CaCO_3$)	164	Manganese (Mn)	0.03
Bicarbonate (HCO_3)	181.	3.00	Calcium Hardness ($CaCO_3$)	60	Boron (B)	0.1
Carbonate (CO_3)	0.0	0.00	Magnesium Hardness ($CaCO_3$)	104	Fluoride (F)	0.33
Phosphate (PO_4)	0.1	0.00	Total Solids - Calculated	233		
Total Equivalents Per Million		4.34	Total Solids - Evaporation	245		
CATIONS	MILLIGRAMS PER LITER	EQUIVALENTS PER MILLION	Loss On Ignition			
Sodium (Na)	20.	0.87	Total Fixed Residue			
Potassium (K)	0.40	0.01				
Calcium (Ca)	24.	1.20				
Magnesium (Mg)	25.	2.06				
Total Equivalents Per Million		4.14	Sp. Cond. - Micromhos 25°C	346	Hyd. Ion Conc. (pH)	7.24

THIS IS AN APPROVED COMMERCIAL WATER LABORATORY DESIGNATED BY THE STATE OF CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

COMMENTS:

ORIGINAL GEOTECHNICAL INVESTIGATION

Reported by Philip H. Harten

PLATE H-16A

FORM C 9/68

GROUNDWATER ANALYSIS

CELL A & E SUBDRAIN

	SAMPLE DATE				
COMPONENT *	12-8-71	1-7-72	2-15-72	3-14-72	3-28-72
Temperature** (°C)		15.0	16.5	17.5	16.0
Alkalinity ($CaCO_3$)	116				
B.O.D.	0				
Cadmium					
Calcium	10				
C.O.D.	4				
Color (Color Units)	5				
Copper					
Chloride	23				
Dissolved Oxygen ppm		4.4	5.5	4.3	4.9
Elect.Cond. µ mhos/cm		400	320	340	300
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Lead					
Magnesium	22				
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Nitrogen - Nitrite					
Phosphate-Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.	216				
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc					
pH	5.6	5.8	5.5	5.4	5.5
Sulphate					

* Units in mg/l unless noted
** Temperature of sample when tested for DO, EC, and pH.

Plate H-17A

GROUNDWATER ANALYSIS

CELL A & E SUBDRAIN

	SAMPLE DATE				
COMPONENT *	4-25-72	5-23-72	6-6-72	6-20-72	7-11-72
Temperature** (°C)	17.0	17.0		18.5	20.5
Alkalinity ($CaCO_3$)					
B.O.D.					
Cadmium					
Calcium					
C.O.D.					
Color (Color Units)					
Copper					
Chloride					
Dissolved Oxygen ppm	5.9	4.9	7.6	5.2	5.5
Elect.Cond. µ mhos/cm	350	350	360	320	350
Fecal Coli. MPN/100 ml					
Fecal Strep. MPN/100 ml					
Lead					
Magnesium					
Mercury					
Nitrogen - Ammonia					
Nitrogen - Organic					
Nitrogen - Nitrate					
Nitrogen - Nitrite					
Phosphate -Total, as P					
P.C.B. ppb					
Potassium					
Sodium					
Solids - T.D.S.					
Solids - T.S.S.					
Solids - Settle. ml/l					
Volatile Acids					
Zinc					
pH	5.5	5.7	5.9	6.7	5.7
Sulphate					

* Units in mg/l unless noted
**Temperature of sample when tested for DO, EC, and pH.

Plate H-17B

GROUNDWATER ANALYSIS

CELL A & E SUBDRAIN

COMPONENT *	SAMPLE DATE 9-7-72	 11-30-72	 1-10-73	 3-27-73	
Alkalinity	140	130		150	
B.O.D.		0			
Cadmium	0	0		0	
Calcium	38	56		46	
C.O.D.	8.7	0		1	
Chloride	11	13		18	
Color (Color Units)		4			
Copper	0	0.02		0.06	
Dissolved Oxygen ppm	7.0	5.6	9.4	6.0	
Elect. Cond. μ mhos/cm	825	450	700	420	
Fecal Coli. MPN/100 ml		<3			
Fecal Strep. MPN/100 ml		<3			
Iron	0.1	0.4		0.13	
Lead	0	0		0	
Magnesium	12	16		13	
Mercury	0.0025	0.0165			
Nitrogen - Ammonia		0			
Nitrogen - Organic		0			
Nitrogen - Nitrate		1.67			
Phosphate-Total, as P					
P.C.B. ppb		0			
Potassium	0.70	0.9		1.1	
Sodium	30	22		30	
Solids - T.D.S.	186	330		220	
Solids - T.S.S.					
Solids - Settle. ml/l					
Sulphate	15	16		14	
Temperature** (°C)	23.5	15.0	9.0	16.0	
Volatile Acids					
Zinc	0.05	0.03		0.06	
pH	6.1	5.9	7.6	6.0	

* Units in mg/l unless noted.

** Temperature of sample when tested for DO, EC and pH.

Plate H-17C

OBSERVATION WELLS AND PIEZOMETERS

Depth to Water Level - Feet

DATE	WELLS				PIEZOMETERS					
	1	2	3	4	1	2	3	4	5	6
1-18-72	6.5	7.0	8.5	18.5	10.0	1.0	None			
3-2-72	6.0	8.0	7.0	19.0						
3-14-72	5.5	6.6	6.4	18.5	5.9	1.0	7.7			
3-28-72	5.7	7.2	6.5	18.5						
4-11-72	5.5	7.1	6.3	18.7	4.6	1.4	5.4			
4-25-72	5.7	7.3	6.2	18.9						
5-9-72	5.7	7.4	6.4	18.9	3.6	1.7	4.0			
5-23-72	5.8	7.5	6.6	19.0						
6-6-72	5.7	7.6	5.8	19.1						
7-11-72	6.0	8.1	7.7	19.3	2.3	1.5	2.3			
7-25-72	-	-	-		2.4	1.9	2.4			
8-8-72	6.1	8.1	8.4	19.4	-	-	-			
9-7-72	6.1	8.2	9.1	19.5	2.2	1.9	2.1			
10-11-72	6.4	8.1	9.7							
11-8-72	6.1	6.3	6.9							
11-30-72	5.9	6.4	4.7							
12-19-73				17.0	1.8	0.3	1.8			
1-10-73	4.7	4.2	3.8							
2-6-73	4.1	3.3	2.4							
3-13-73	2.8	3.8	3.8							
3-27-73	-	-	-	14.1	0.8	0.0	0.9			
4-10-73	2.7	3.6	3.8							
5-15-73	3.6	4.2	3.1							
6-26-73	3.9	7.4			0.7	0.0	0.5			

PLATE H-18A

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
12-7-71	-	830	-
12-15-71	Tr	833	Tr
12-19-71	Tr	834	0.1
12-28-71	Tr	837	0.1
1-3-72	Tr	838	0.3
1-11-72	Tr	838	0.7
1-18-72	Tr	838	0.9
2-15-72	0.3	838	1.9
3-2-72	0.3	838	2.1
3-14-72	0.3	838	2.2
3-28-72	0.3	838	2.2
4-11-72	0.3	838	2.2
4-25-72	0.3	838	2.2
9-7-72	0.8	-	-
10-15-72	30.8	898	-
10-17-72	50.8	958	17.2
10-18-72	--	1018	-
10-19-72	80.8	1083	22.2
10-20-72	80.8	1093	22.2
10-21-72	80.8	1153	22.2
10-24-72	81.8	1164	23.7
11-8-72	81.8	1164	46.2
11-27-72	81.8	1164	71.2
12-6-72	81.8	1164	81.2
12-11-72	81.8	1164	90.2
12-18-72	81.8	1164	116.2
12-21-72	84.3	1164.5	116.7

(1) An estimated 1710 gallons of rainwater added to Cell A during construction.
(2) An estimated 7268 gallons of rainwater and 34,000 gallons of additional water added to Cell B to obtain field capacity.
(3) An estimated 7420 gallons of rainwater and 27,000 gallons of septic tank pumpings added to Cell E during construction.

PLATE H-19A

CUMULATIVE LEACHATE PRODUCTION

Date	(1) Cell A - Gallons	(2) Cell B - Gallons	(3) Cell E - Gallons
12-26-72	84.3	1164.5	146.7
1-4-73	114.3	1164.5	241.7
1-11-73	114.3	1164.5	341.7
1-18-73	119.3	1164.5	459.7
1-26-73	135.3	1165	590.2
2-1-73	140.3	1165	782.2
2-8-73	140.3	1165	980.2
2-15-73	140.3	1165	1171.2
2-22-73	145.8	1170.5	1352.7
3-1-73	145.8	1170.5	1490.7
3-8-73	145.8	1170.5	1632.7
3-15-73	145.8	1170.5	1753.7
3-22-73	145.8	1170.5	1775.7
3-29-73	145.8	1170.5	1874.7
4-5-73	145.8	1170.5	1959.7
4-12-73	145.8	1170.5	2041.7
4-19-73	145.8	1170.5	2120.7
4-26-73	146.0	1171.0	2189.2
5-3-73	146.0	1171.0	2253.2
5-10-73	146.0	1171.0	2314.2
5-17-73	146.0	1171.0	2368.2
5-24-73	146.5	1171.0	2417.7
5-31-73	146.5	1171.0	2465.7
6-7-73	146.5	1171.0	2414.7
6-14-73	146.5	1171.0	2464.7
6-21-73	146.5	1171.0	2505.7
6-28-73	146.5	1171.0	2548.7

PLATE H-19B

LYSIMETER SAMPLE FIELD ANALYSIS

Lysimeter Location	Date	Volume ml	pH	D.O.* ppm	E.C. µ mhos/cm
Cell A - 4 feet below bottom of Cell	1-18-72	200	5.6	5.0	380
	2-15-72	30	7.1	8.4	-
	3-14-72	30	7.1	7.8	-
	5-23-72	70	6.5	9.0	-
	6-20-72	50	8.4	-	-
	9-20-72	30	5.9	9.0	-
	12-19-72	50	6.5	-	-**
	4-10-73	blocked	-	-	-
Cell A - 8 feet below bottom of Cell	1-18-72	400	5.7	1.3	310
	2-15-72	200	7.0	9.3	-
	3-14-72	50	7.4	8.1	-
	5-23-72	240	6.9	10.0	-
	6-20-72	250	7.3	9.2	160
	9-20-72	400	6.4	9.6	275
	12-19-72	150	6.8	10.2	300
	4-10-73	0	-	-	-
Cell E - 8 feet below bottom of Cell	12-15-71	50	7.4	-	-
	1-18-72	300	6.6	5.9	290
	2-15-72	35	7.4	8.7	-
	3-14-72	50	6.9	8.0	-
	5-23-72	35	7.1	10.4	-
	6-20-72	50	8.3	-	-
	9-20-72	30	7.2	8.9	-
	12-19-72	50	7.0	-	-**
	4-10-73	blocked	-	-	-

* Water samples are collected from lysimeters by displacing the sample with air from a pressurized tank. This procedure thoroughly aerates the sample.

** Insufficient quantity for D.O. or E.C. tests.

Plate H-21A

SOLUTION ANALYSIS

Silty Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	
Calcium	30	34	48	
Electrical Conductivity	500	500	600	
Magnesium	30	23	29	
Potassium	3.5	1.85	17.0	
Sodium	31	32	34	
pH	7.2	7.7	8.8	

Concrete Sand

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	170	170	168	
Calcium	28	36	32	
Electrical Conductivity	500	500	500	
Magnesium	31	23	28	
Potassium	2.2	1.75	1.8	
Sodium	31	31.6	32	
pH	7.2	7.9	8.7	

Pea Gravel

Determination - mg/l	Time After Immersion			
	1 week	6 months	1 year	2 years
Alkalinity	180	190	190	
Calcium	33	54	40	
Electrical Conductivity	480	550	460	
Magnesium	26	16	25	
Potassium	1.9	1.95	2.0	
Sodium	31	29.6	31	
pH	7.3	7.3	9.2	

Plate H-22A

RAINFALL, EVAPORATION AND RUNOFF

NOV. 1971	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12	0.29					
13	0.25					
14						
15						
16	0.02					
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29	0.96					
30						
TOTALS	1.52					

Evaporation reported in Inches

REMARKS

No Evaporation or runoff data was taken for this month.

PLATE H-23 A

RAINFALL, EVAPORATION AND RUNOFF

DEC. 1971	RAIN FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2	0.50					
3	0.32					
4						
5						
6	0.24					
7						
8						
9	0.27					
10	0.09					
11	0.03					
12						
13	0.77					
14						
15	0.05					
16						
17						
18						
19						
20						
21						
22	0.51					
23	0.22					
24	0.06					
25						
26						
27	1.77					
28						
29	0.03					
30						
31						
TOTALS	4.86					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

PLATE H-23 B

RAINFALL, EVAPCRATION AND RUNOFF

JAN. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20	0.13					
21	0.09					
22	0.11					
23						
24	0.25					
25	0.28					
26	0.01					
27	0.58					
28	0.03					
29						
30						
31						
TOTALS	1.48					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

PLATE H-23C

RAINFALL, EVAPCRATION AND RUNOFF

FEB. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1						
2	0.50					
3	0.84					
4						
5						
6						
7	1.30					
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22	0.39					
23	0.02					
24	0.03					
25						
26						
27						
28	0.08					
29	0.15					
30						
TOTALS	3.31					

Evaporation reported in Inches

REMARKS

No evaporation or runoff data was taken for this month.

PLATE H-23D

RAINFALL, EVAPORATION AND RUNOFF

MARCH 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.160	732		420	
2	0.10	.128				
3	0.08	.032				
4		.077				
5		.077				
6		.192				
7		.077				
8		.160				
9		.064				
10	0.05	.128				
11		.128				
12		.077				
13		.064				
14		.128				
15		.128				
16		.192				
17		.064				
18		.077				
19		.077				
20		.064				
21		.064				
22		.077				
23		.077				
24		.077				
25	0.25	.064	732	0	420	0
26		.288				
27		.160				
28		.064				
29		.064				
30		.160				
31		.064				
TOTALS	0.48	3.253		0		0

Evaporation reported in Inches

REMARKS

Evaporation and runoff meters were operational as of March 1st.

Runoff meter readings are the initial readings after testing.

PLATE H-23 E

RAINFALL, EVAPORATION AND RUNOFF

APRIL 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.064				
2		.128				
3		.077				
4		.192				
5	0.15	.077	732	0	420	0
6	0.15	.128	732	0	420	0
7		.064				
8		.160				
9		.160				
10		.160				
11	0.58	.160	732	0	420	0
12		.160				
13	0.26	.160	732	0	420	0
14		.160				
15		.160				
16		.160				
17		.160				
18		.256				
19		.256				
20		.256				
21		.256				
22		.256				
23	0.22	.256	732	0	549*	0
24		.256				
25		.256				
26		.256				
27		.256				
28		.256				
29		**				
30		**				
31		**				
TOTALS	1.36	5.146		0		0

Evaporation reported in Inches

REMARKS

* Ran flow test on drainage meter. This flow was not due to rainfall runoff.

** Evaporation gage was being repaired and was not available for recording on these dates.

PLATE H-23 F

RAINFALL, EVAPCRATION AND RUNOFF

MAY 1972	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		*	732	0	549	0	* Evaporation gage was being repaired and was not available for recording on these dates.
2		*					
3		*					
4		*					
5		*					
6		*					
7		*					
8		*					
9		*					
10		.128					
11		.256					
12		.288					
13		.288					
14		.256					
15		.128					
16		.128					
17		.160					
18		.160					
19		.192					
20		.128					
21		.160					
22		.077					
23		.224					
24		.077					
25		.128					
26		.077					
27		.064					
28		.064					
29		.256					
30		.160					
31		.160					
TOTALS	0.00	3.559		0		0	

Evaporation reported in Inches

PLATE H-23G

RAINFALL, EVAPCRATION AND RUNOFF

JUNE 1972	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.192					
2		.160					
3		.128					
4		.128					
5		.352					
6		.160					
7		.160					
8		.160					
9	.19	.064	732	0	549	0	
10		.128					
11		.256					
12		.288					
13		.192					
14		.224					
15		.256					
16		.256					
17		.224					
18		.192					
19		.128					
20		.192					
21		.077					
22		.128					
23		.128					
24		.256					
25		.160					
26		.077					
27		.160					
28		.128					
29		.077					
30		.256	732	0	549	0	
TOTALS	0.19	5.287		0		0	

Evaporation reported in Inches

PLATE H-23 H

RAINFALL, EVAPORATION AND RUNOFF

JULY 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.397	732	0	549	0
2		.160				
3		.192				
4		.192				
5		.192				
6		.077				
7		.160				
8		.160				
9		.320				
10		.800				
11		.397				
12		.512				
13		.768				
14		.896				
15		.576				
16		.320				
17		.224				
18		.256				
19		.128				
20		.128				
21		.160				
22		.160				
23		.064				
24		.192				
25		.160				
26		.192				
27		.320				
28		.192				
29		.160				
30		.128				
31		.224				
TOTALS	0.00	9.111		0		0

Evaporation reported in Inches

REMARKS

PLATE H-23 I

RAINFALL, EVAPORATION AND RUNOFF

AUG. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.288				
2		.192				
3		.128				
4		.160				
5		.320				
6		.192				
7		.224				
8		.224				
9		.160				
10		.128				
11		.128				
12		.320				
13		.320				
14		.205	763*	0	783*	0
15		.192				
16	TR	.077				
17		.224				
18		.160				
19		.077				
20		.192				
21		.224				
22		.288	1168*	0	1569*	0
23		.256				
24		.352				
25		.384				
26		.192				
27		.192				
28		.192				
29		.128				
30		.192				
31		.128				
TOTALS	TR	6.439		0		0

Evaporation reported in Inches

REMARKS

* Meter Flow due to Testing and Adjusting

PLATE H-23 J

RAINFALL, EVAPCRATION AND RUNOFF

SEPT. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.128				
2		.128				
3		.320				
4		.192				
5		.160				
6		.224				
7		.077				
8		.160				
9		.160				
10		.384				
11		.160				
12		.192				
13		.160				
14		.064				
15		.077				
16		.128				
17		.192				
18		.224				
19		.224				
20		.320				
21		.288				
22		.288				
23		.320				
24		.384				
25		.128				
26	.52	.064	1168*	0	1569*	0
27	.11	.064				
28		.160				
29		.288				
30		.077				
TOTALS	0.63	2.829		0		0

Evaporation reported in Inches

REMARKS

* No visable runoff from test cell area due to this rain.

PLATE H-23 R

RAINFALL, EVAPCRATION AND RUNOFF

OCT. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.160				
2		.256				
3		.077				
4		.077				
5		.224				
6		.512				
7		.256				
8		.192				
9	0.52	.064				
10	0.14	.064	1168*	0	1569*	0
11	0.33	.000				
12	1.12	.000	1168*	0	1569*	0
13	0.51	.064				
14	2.17	.000				
15	0.06	.077	3702	2534	3816	1247
16	0.26	.077				
17	0.57	.064	6221	2519	4940	1124
18		.064				
19		.064	6221	0	4940	0
20		.128				
21		.064	2221**	0	5087**	0
22		.000				
23		.128				
24		.224				
25		.256				
26		.096				
27		.000				
28		.128				
29		.192				
30		.480				
31		.096	2221		5087	
TOTALS	5.68	4.084		5053		2371

Evaporation reported in Inches

REMARKS

* No visual runoff from cells due to these rainfalls.

** Cell "B" runoff meter test. Cells A & E meter was turned back during servicing and testing.

PLATE H-23 L

RAINFALL, EVAPCRATION AND RUNOFF

NOV. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.064	2221		5087	
2		.077				
3	1.33	.032				
4	0.01	.000	4889	2668	6500	1413
5		.064				
6		.064				
7	0.56	.064	6183	1249	7438	938
8		.288	6670	532	7588	150
9		.128				
10	0.70	.128				
11	0.34	.224	8350	1680	8240	652
12		.192				
13	1.06	.160	13000	4650	10050	1810
14		.160				
15	2.09	.192	23600	10600	15560	5510
16	0.27	.288	25790	2190	16320	760
17		.288				
18	0.04	.256				
19	0.14	.128				
20		.224				
21		.096				
22		.192				
23		.192				
24		.128				
25		.064				
26		.064				
27		.320	25800	10	16380	60
28		.224				
29		.160				
30		.064	25800	0	16380	0
TOTALS	6.54	4.525		23579		11293

Evaporation reported in Inches

REMARKS

PLATE H-23 M

RAINFALL, EVAPCRATION AND RUNOFF

DEC. 1972	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.032	25800	0	16380	0
2		.000				
3	0.24	.032				
4		.288	25800	0	16380	0
5	0.32	.256				
6	0.56	.192	27410	1610	16910	530
7		.320				
8		.416				
9		.320				
10		.320				
11		.192	28790	1380	17540	630
12		.128				
13	0.03	.128				
14		.000				
15	0.50	.096				
16	1.83	.096				
17	0.15	.000	36000	7210	19280	1740*
18	0.05	.032				
19	1.06	.000	41460	5460	21880	2600
20		.000				
21		.000				
22	0.12	.256	41490	30	21880	0
23	0.10	.032				
24		.352				
25		.864				
26		.160	41490	0	21880	0
27		.064				
28	0.10	.480	41490	0	21880	0
29		.352				
30		.288				
31		.736				
TOTALS	5.06	6.432		15690		5500

Evaporation reported in Inches

REMARKS

* Meter failed during this period at runoff. Meter repaired.

PLATE H-23 N

RAINFALL, EVAPORATION AND RUNOFF

JAN. 1973	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.800				
2		.224				
3		.352				
4		.288	41490	0	21880	0
5		.244				
6		.256				
7		.000				
8	1.20	.032	45870	4380	24080	2200
9	1.03	.064	50940	5070	26340	2260
10	0.22	.064	51830	890	26780	440
11	3.07	.032	71700	19870	36540	9760
12	2.73	.000	91800	20100	45790	9250
13		.064				
14		.192				
15	0.10	.096	91810	10	45920	130
16	2.17	.224	106250	14440	51960	6040
17		.160				
18	1.81	.224	119800	13550	57630	5670
19		.416	119800	0	57630	0
20	0.50	.224				
21		.128				
22		.128	121890	2090	58060	430*
23		.128	121890	0	58060	0
24	0.24	.064	121890	0	58060	0
25	0.16	.288	122610	720	58270	210*
26		.256	122610	0	58270	0 *
27		.288				
28		.288				
29	0.69	.128	124500	1890	58560	290*
30	0.08	.160	126380	1880	59100	540*
31	0.16	.244	126940	560	59170	70*
TOTALS	14.16	6.036		85450		37290

Evaporation reported in Inches

REMARKS

* Cell "B" runoff metering device malfunction. Results questionable till 2/17/73.

PLATE H-23 O

RAINFALL, EVAPORATION AND RUNOFF

FEB. 1973	RAIN-FALL	EVAP.	RUNOFF			
			CELLS A & E		CELL B	
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS
1		.288	126940	0	59170	0 *
2	0.05	.192	126950	10	59170	0 *
3	0.40	.224				
4	1.04	.320				
5	0.35	.192				
6	0.92	.128	136560	9610	62350	3180*
7	0.04	.192	143150	6590	64990	2640*
8	0.06	.160	143190	40	64990	0
9	0.86	.160				
10	0.29	.096				
11	0.05	.224				
12	0.22	.096				
13	0.59	.128				
14	0.86	.288				
15		.288	160860	17670	71790	6800*
16		.288				
17	0.01	.288	160860	0	71790	0**
18		.384				
15		.256				
20		.416				
21		.544				
22		.256	160860	0	71860	70
23		.288				
24	0.76	.384	163423	2563	73530	1670
25	0.01	.320				
26	0.96	.224				
27	1.04	.096	172760	9337	78680	5150
28	0.03	.224				
29						
30						
TOTALS	8.54	6.944		45820		19510

Evaporation reported in Inches

REMARKS

* Cell "B" runoff metering device malfunction. Results questionable. till 2/17/73

PLATE H-23P

RAINFALL, EVAPCRATION AND RUNOFF

MARCH 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1	0.04	.288	176440	3680	81030	2350	
2		.352	176440	0	81030	0	
3	0.86	.064					
4	0.01	.192					
5		.224					
6	0.47	.256					
7		.288					
8	0.38	.320	183210	6770	86130	5100	
9		.288					
10	0.18	.096					
11		.384					
12		.576					
13		.800					
14		.736					
15		.288	183210	0	86300	170	
16		.256					
17		.416					
18		.320					
19	0.56	.064					
20		.416					
21	0.32	.384					
22		.384	184780	1570	87710	1410	
23		.544					
24		.224					
25		.256					
26		.288					
27		.544					
28		.640					
29		.448	184780	0	87710	0	
30	0.58	.032					
31		.448					
TOTALS	3.40	10.816		12020		9030	

Evaporation reported in Inches

PLATE H-23Q

RAINFALL, EVAPCRATION AND RUNOFF

APRIL 1973	RAIN-FALL	EVAP.*	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.576					
2		1.153					
3		.800					
4		.800					
5		.512	185780	1000	88440	730	
6		.488					
7		.608					
8		.672					
9		.672					
10		.768					
11		.320					
12		.480	185780	0	88440	0	
13	0.19	.320					
14		.384					
15		.480					
16		.192	185780	0		0	
17		.640	185780	0		0	
18		.640					
19		.640	185780	0	88440	0	
20		.961					
21		1.280					
22		.640					
23		.640					
24		.608					
25		.576	18780	0	88440	0	
26		.224					
27		.268					
28		.320					
29		.352					
30		.640	185680	0	88440	0	
TOTALS	0.19	17.674		1000		730	

*Evaporation reported in Inches

PLATE H-23 R

RAINFALL, EVAPCRATION AND RUNOFF

MAY 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.320	185780	0	88440	0	
2		.320					
3		.384	185780	0	88440	0	
4		.412					
5		.448					
6		.544					
7		.736					
8		.832					
9		.412					
10		1.152	185780	0	88440	0	
11		.800					
12		.480					
13		.576					
14		.544					
15		.544					
16		.544					
17		.704	185780	0	88440	0	
18		.384					
19		.416					
20		.544					
21		.480					
22		.448					
23		.320	185780	0	88440	0	
24	0.07	.256					
25	0.01	.608					
26		.832					
27		.928					
28		.928					
29		.480					
30		.480					
31		.448					
TOTALS	0.08	17.304		0		0	

Evaporation reported in Inches

PLATE H-23 S

RAINFALL, EVAPCRATION AND RUNOFF

JUNE 1973	RAIN-FALL	EVAP.	RUNOFF				REMARKS
			CELLS A & E		CELL B		
			METER READING	TOTAL GALLONS	METER READING	TOTAL GALLONS	
1		.512					
2		.480					
3		.608					
4		.480					
5		.384					
6		1.217					
7		1.153	185780	0	88440	0	
8		1.856					
9		.961					
10		.864					
11		.864					
12		.928					
13		.864					
14		.896	185780	0	88440	0	
15		.832					
16		.512					
17		1.121					
18		1.153					
19		1.249					
20		1.217	185780	0	88440	0	
21		1.376					
22		.576					
23		.480					
24		.896					
25		1.249					
26		1.664					
27		1.217					
28		.640	185780	0	88440	0	
29		.704					
30		.704					
TOTALS		27.657		0		0	

Evaporation reported in Inches

PLATE H-23T

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	11-16-71	11-22-71	11-23-71	12-6-71	12-10-71	12-14-71
A-1	280.89	280.47	280.57	280.45		
A-2	280.34	279.91	280.09	279.95		
A-3	280.36	279.83	279.98	279.81		
A-4	280.76	280.15	280.30	280.08		
A-5	280.59	279.98	280.20	279.96		
B-1				307.28		
B-2				307.10		
B-3				306.99		
B-4				306.43		
B-5				307.11		
C-1						307.93
C-2						307.85
C-3						307.79
C-4						307.79
C-5						307.53
D-1						
D-2						
D-3						
D-4						
D-5						
E-1					281.27	
E-2					281.14	
E-3					281.15	
E-4					280.70	
E-5					280.85	

PLATE H-24A

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	12-21-71	12-28-71	12-30-71	1-7-72	1-14-72	1-24-72
A-1	280.52		280.39	280.52	280.52	280.51
A-2	279.94		279.95	280.03	280.03	280.02
A-3	279.88		279.82	279.92	279.92	279.91
A-4	280.23		280.09	280.23	280.23	280.22
A-5	280.03		280.11	280.11	280.11	280.10
B-1	307.15		306.95	306.97	306.97	306.96
B-2	306.92		306.74	306.75	306.75	306.73
B-3	306.69		306.48	306.52	306.51	306.49
B-4	306.20		305.94	306.03	306.02	306.01
B-5	306.87		306.61	306.67	306.66	306.65
C-1			307.47	307.44	307.42	307.40
C-2			307.44	307.38	307.36	307.34
C-3			307.26	307.19	307.18	307.15
C-4			307.40	307.33	307.31	307.29
C-5			307.13	307.06	307.04	307.02
D-1		306.97	306.55	306.51	306.49	306.45
D-2		307.21	306.77	306.76	306.74	306.71
D-3		306.82	306.27	306.27	306.24	306.20
D-4		305.91	305.55	305.57	305.55	305.51
D-5		306.16	305.59	305.64	305.61	305.58
E-1	280.90		280.70	280.94	280.93	280.91
E-2	280.73		280.57	280.83	280.74	280.72
E-3	280.72		280.47	280.76	280.75	280.73
E-4	280.35		280.20	280.47	280.47	280.45
E-5	280.60		280.34	280.70	280.68	280.67

PLATE H-24B

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	1-31-72	2-14-72	3-2-72	3-31-72	4-28-72	6-1-72
A-1	280.51	280.50	280.52	280.49	280.50	280.50
A-2	280.00	280.01	280.03	280.01	280.02	280.02
A-3	279.91	279.91	279.91	279.90	279.91	279.89
A-4	280.22	280.22	280.23	280.22	280.22	280.21
A-5	280.10	280.10	280.10	280.09	280.10	280.10
B-1	306.95	306.95	306.95	306.93	306.93	306.93
B-2	306.72	306.72	306.72	306.71	306.71	306.70
B-3	306.50	306.49	306.48	306.47	306.46	306.46
B-4	306.01	306.00	306.00	305.99	305.98	305.98
B-5	306.65	306.64	306.63	306.62	306.61	306.61
C-1	307.40	307.38	307.37	307.35	307.33	307.32
C-2	307.34	307.31	307.31	307.28	307.26	307.24
C-3	307.14	307.12	307.11	307.09	307.06	307.05
C-4	307.28	307.26	307.25	307.22	307.21	307.19
C-5	307.01	307.00	306.99	306.96	306.93	306.90
D-1	306.45	306.42	306.41	306.39	306.37	306.36
D-2	306.70	306.68	306.68	306.66	306.65	306.64
D-3	306.19	306.17	306.16	306.13	306.11	306.11
D-4	305.55	305.48	305.48	305.45	305.43	305.42
D-5	305.56	305.54	305.53	305.51	305.49	305.48
E-1	280.91	280.90	280.91	280.89	280.89	280.88
E-2	280.71	280.70	280.71	280.67	280.68	280.65
E-3	280.73	280.72	280.72	280.70	280.71	280.71
E-4	280.45	280.44	280.45	280.43	280.44	280.44
E-5	280.67	280.67	280.67	280.65	280.65	280.64

PLATE H-24 C

SETTLEMENT DATA

CELL-MONUMENT	DATE					
	8-17-72	10-13-72	11-20-72	1-3-73	4-4-73	7-3-73
A-1	280.48	280.48	280.46	280.46	280.45	280.45
A-2	280.01	279.99	279.98	279.97	279.97	279.96
A-3	279.89	279.88	279.86	279.86	279.86	279.85
A-4	280.21	280.20	280.18	280.18	280.17	280.17
A-5	280.09	280.08	280.06	280.06	280.06	280.06
B-1	306.89	306.88	306.86	306.86	306.85	306.84
B-2	306.67	306.66	306.64	306.64	306.63	306.63
B-3	306.41	306.40	306.40	306.39	306.38	306.37
B-4	305.95	305.94	305.93	305.93	305.92	305.92
B-5	306.57	306.56	306.55	306.55	306.54	306.53
C-1	307.28	307.25	307.23	307.23	307.22	307.21
C-2	307.19	307.15	307.12	307.11	307.10	307.09
C-3	306.98	306.95	306.93	306.91	306.90	306.89
C-4	307.14	307.11	307.10	307.08	307.07	307.07
C-5	306.84	306.80	306.77	306.76	306.75	306.74
D-1	306.31	306.28	306.26	306.25	306.24	306.24
D-2	306.59	306.56	306.54	306.53	306.51	306.50
D-3	306.03	305.99	305.97	305.95	305.94	305.92
D-4	305.36	305.33	305.31	305.30	305.29	305.28
D-5	305.39	305.36	305.33	305.31	305.29	305.24
E-1	280.86	280.85	280.83	280.82	280.81	280.80
E-2	280.61	280.60	280.58	280.57	280.56	280.54
E-3	280.67	280.66	280.65	280.64	280.63	280.62
E-4	280.42	280.41	280.39	280.39	280.37	280.37
E-5	280.61	280.60	280.58	280.58	280.57	280.56

PLATE H-24 D

FLUID ROUTING CELL "C"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
1971 *				2000*				14933*	12933
12-30	5.8				68.1	1.0	67.1	803.2	
12-31	6.5				73.5	1.0	72.5	868.4	
1972 1-3	7.8				73.5	1.0	72.5	868.4	
1-4	7.9				73.5	1.0	78.5	868.4	
1-5	7.9				73.3	1.0	72.3	865.4	
1-7	8.5				73.2	1.0	72.2	865.4	
1-10	8.6				73.5	1.0	72.5	868.4	
1-11	8.8				68.0	1.0	67.0	802.5	
1-12	8.8				73.5	1.0	72.5	868.4	
1-13	9.0				73.5	1.0	72.5	868.4	
1-14	9.0				73.5	1.0	72.5	868.4	
1-17	9.4				74.3	1.0	73.3	877.4	
1-18	9.5				72.7	0.0	72.7	870.5	
1-19	9.6				72.6	0.0	72.6	869.0	
1-20	10.1				73.2	0.0	73.2	876.2	
1-21	12.4				83.5	0.0	83.5	999.5	
1-24	28.4				73.8	0.0	73.8	883.4	
1-25	33.2				72.3	0.0	72.3	865.4	
1-26	40.3				73.3	0.0	73.3	877.4	

Leachate This Sheet	2000	Distribution This Sheet	31467
Leachate Prior Sheet	0	Distribution Prior Sheet	0
Total Leachate	2000	Total Distribution	31467

*8,000 gallons applied by water truck during refuse placement. 6,993 gallons applied by 2.27"total rainfall during refuse placement operation.

PLATE H-25A

FLUID ROUTING CELL "C"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
1972 1-27	49.4				72.8	0.0	72.8	871.4	
1-28	60.6	1.0	59.6	713.4	74.3	0.0	74.3	889.3	29625
1-31	39.5	1.0	38.5	460.8	72.5	6.7	65.8	787.6	30054
2-1	9.4				73.0	0.0	73.0	873.8	
2-2	19.5				71.5	0.0	71.5	855.9	
2-3	31.1				00.0	0.0	00.0	000.0	
2-4	42.2	1.4	40.8	488.4	00.0	0.0	00.0	000.0	32082
2-7	34.8	2.0	32.8	392.6	71.4	0.0	71.4	854.7	31690
2-8	11.0				72.2	1.0	71.2	852.3	
2-9	22.8				72.4	1.5	70.9	848.7	
2-10	34.0	24.1	9.9	118.5	72.5	1.6	70.9	848.7	34127
2-11	35.1	22.7	12.4	271.7	72.9	1.0	71.9	860.6	34704
2-12	45.6	1.0	44.6	533.9	1.0	1.0	00.0	000.0	35031
2-13	25.1				1.0	1.0	00.0	000.0	
2-14	39.3				72.5	1.0	71.5	855.9	
2-15	53.1	1.4	51.7	618.8	72.4	1.2	71.2	852.3	35268
2-16	14.4				72.2	1.0	71.2	852.3	
2-17	34.3				72.5	1.0	71.5	855.9	
2-18	58.3	6.0	52.3	626.0	72.5	1.4	71.1	851.1	37202
2-19	32.4				72.6	1.0	71.6	857.1	

Leachate This Sheet	4224	Distribution This Sheet	13668
Leachate Prior Sheet	2000	Distribution Prior Sheet	31467
Total Leachate	6224	Total Distribution	45135

PLATE H-25 B

FLUID ROUTING CELL "C"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972 2-20	60.3	5.0	55.3	661.9	72.8	1.0	71.8	859.4	38249
2-21	33.2				72.5	1.0	71.5	855.9	
2-22	62.2	1.0	61.2	732.6	73.2	4.3	68.9	824.7	39231
2-23	31.1				72.8	13.3	59.5	712.2	
2-24	67.5	1.0	66.5	796.0	72.3	28.2	44.1	527.9	39972
2-25	24.0				72.9	1.0	71.9	860.6	
2-26	54.7	4.0	50.7	606.9	72.3	1.0	71.3	853.5	40754
2-27	30.3				72.5	3.0	69.5	831.9	
2-28	64.5	6.0	58.5	700.2	72.3	1.0	71.3	853.5	41739
2-29	48.2	1.6	47.2	564.9	74.5	1.0	73.5	879.8	42028
3-1	37.8	5.0	32.8	392.6	72.5	1.0	71.5	855.9	42515
3-2	42.9	6.0	36.9	441.7	72.5	1.0	71.5	855.9	42929
3-3	44.1	6.0	38.1	456.1	72.7	1.0	71.7	858.2	43329
3-4	45.5	5.0	40.5	484.8	72.7	1.0	71.7	858.2	43702
3-5	40.7	5.0	35.7	427.3	72.7	1.0	71.7	858.2	44133
3-6	42.3	5.0	37.3	446.5	72.9	2.0	70.9	848.7	44545
3-7	45.0	5.0	40.0	478.8	72.6	1.0	71.6	857.1	44915
3-8	44.3	6.0	38.3	458.5	72.8	1.0	71.8	859.4	45313
3-9	47.9	5.0	42.9	513.5	72.9	1.0	71.9	860.6	45659
3-10	46.8	5.0	41.8	500.3	72.9	1.0	71.9	860.6	46020
3-11	49.1	5.1	44.1	527.9	72.8				46352

Leachate This Sheet	9191	Distribution This Sheet	16632
Leachate Prior Sheet	6224	Distribution Prior Sheet	45135
Total Leachate	15415	Total Distribution	61767

PLATE H-25 C

FLUID ROUTING CELL "C"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972						1.0	71.8	859.4	
3-12	46.6	5.0	41.6	497.9	72.9	1.0	71.9	860.6	46714
3-13	45.3	4.0	41.3	494.4	72.9	1.0	71.9	860.6	47080
3-14	49.6	5.0	44.6	533.9	73.0	1.0	72.0	861.8	47407
3-15	51.4	5.0	46.4	555.4	73.0	1.0	72.0	861.8	47714
3-16	61.7	6.4	55.3	661.9	1.0				47913

Leachate This Sheet	2743	Distribution This Sheet	4304
Leachate Prior Sheet	15415	Distribution Prior Sheet	61767
Total Leachate	18158	Total Distribution	66071

PLATE H-25 D

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
3-16-72	000		000		
3-17-72	362	362	1233	1233	48784
3-24-72	3822	3460	6771	5538	50862
3-26-72	5118	1296	8366	1595	51161
3-28-72	6293	1175	9881	1515	51501
3-30-72	7350	1057	11810	1929	52373
4-1-72	8475	1125	13412	1602	52850
4-5-72	11193	2718	16692	3280	53412
4-7-72	12556	1363	19264	2572	54621
4-10-72	14592	2036	21901	2637	55222
4-11-72	15391	799	23438	1537	55960
4-14-72	17734	2343	26352	2914	56531
4-21-72	22072	4338	33368	7016	59209
4-28-72	27102	5030	40303	6935	61114
5-8-72	33540	6438	49330	9027	63703
5-11-72	35191	1651	51477	2147	64199
5-17-72	39010	3819	56302	4825	65205
5-23-72	42251	3241	60010	3708	65672
5-31-72	46622	4371	64931	4921	66222
6-9-72	52567	5945	71820	6889	67166

Leachate This Sheet	52567	Distribution This Sheet	71820
Leachate Prior Sheet	18158	Distribution Prior Sheet	66071
Total Leachate	70725	Total Distribution	137891

Plate H-25 E

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	Retained in Refuse
6-16-72	56288	3721	75667	3847	67292
6-23-72	59299	3011	78685	3018	67299
6-29-72	60956	1657	80052	1367	67009
7-3-72	63070	2114	83760	3708	67603
7-10-72	66970	3900	89020	5260	69963
7-18-72	71700	4730	95270	6250	71483
7-25-72	76070	4370	100766	5496	72609
8-1-72	80164	4094	106140	5374	73889
8-9-72	84360	4196	111880	5740	75433
8-14-72	87394	3034	115860	3980	76379
8-22-72	92050	4656	121623	5763	77486
8-30-72	94164	2114	126490	4867	80239
9-5-72	94164	(3300)*	130740	4250	81189
9-18-72	101230	7066	140100	9360	83483
9-27-72	106400	5170	146490	6390	84703
10-3-72	110395	3995	151020	4530	85238
10-10-72	114430	4035	155790	4770	85973
10-19-72	122560	8130	161580	5790	83633
11-7-72	135080	2520	173450	11870	92983
11-16-72	140590	5510	178370	4920	82393

Leachate This Sheet	91323	Distribution This Sheet	106550
Leachate Prior Sheet	70725	Distribution Prior Sheet	137891
Total Leachate	162048	Total Distribution	244441

* Collection line broke and leachate generation data during this period was lost. Estimate 3300 gallons.

Plate H-25 F

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid Retained in Refuse
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	
11-27-72	147780	7190	185920	7550	82753
12-6-72	153130	5350	191030	5110	82513
12-11-72	156050	2920	192770	1740	81333
12-18-72	157880	1830	192770	0	79503
12-26-72	160990	3110	196410	3640	80033
1-4-73	166040	5050	202900	6490	81473
1-11-73	170620	4580	208500	5600	82493
1-18-73	175410	4790	212950	4450	82253
1-26-73	180095	4685	217930	4980	82548
2-1-73	183170	3075	220800	2870	82343
2-8-73	186460	3290	224740	3940	82993
2-15-73	189450	2990	227920	3180	83183
2-22-73	192160	2710	229680	1760	82233
3-1-73	193790	1630	231390	1710	82313
3-8-73	195650	1860	234110	2720	83173
3-15-72	200460	4810	240040	5930	84293
3-22-73	204130	3670	245020	4980	85603
3-29-73	207690	3560	250740	5720	87763
4-5-73	210990	3300	255940	5200	89663
4-12-73	215170	4180	261150	5210	90693

Leachate This Sheet	74580	Distribution This Sheet	82780
Leachate Prior Sheet	162048	Distribution Prior Sheet	244441
Total Leachate	236628	Total Distribution	327221

Plate H-25 G

FLUID ROUTING CELL "C"

Date	Leachate Collection		Distribution		Fluid Retained in Refuse
	Meter Reading	Total Gallons Leachate Generated	Meter Reading	Total Gallons Distributed	
4-19-73	217370	2200	261520	370	88863
4-26-73	220350	2980	265760	4240	90123
5-3-73	222580	2230	269550	3790	91683
5-10-73	224310	1730	271710	2160	92113
5-17-73	226740	2430	277790	6080	95763
5-24-73	227930	1190	282060	4270	98843
5-31-73	229130	1200	283750	1690	99333
6-7-73	231040	1910	288650	4900	102323
6-14-73	233340	2300	292400	3750	103773
6-21-73	236250	2910	297020	4620	105483
6-28-73	238220	1970	300000	2980	106493
7-5-73	240940	2720	304990	4990	108763
7-12-73	242760	1820	308060	3070	110013
7-19-73	245710	2950	313320	5260	112323
7-26-73	248210	2500	317320	4000	113823
8-2-73	250060	1850	322080	4760	116733
8-9-73	253610	3550	326660	4580	117763
8-16-73	256330	2720	330550	3890	118933

Leachate This Sheet		Distribution This Sheet	
Leachate Prior Sheet		Distribution Prior Sheet	
Total Leachate		Total Distribution	

Plate H-25 H

FLUID ROUTING CELL"D"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
*				1500*				8063*	6563
1971 12-30	70.0				56.6	0.0	56.6	682.2	
12-31	5.6				70.6	0.0	70.6	851.8	
1972 1-3	27.5				73.8	0.0	73.8	889.5	
1-4	27.6				73.3	0.0	73.3	883.5	
1-5	27.9				72.2	0.0	72.2	871.4	
1-7	28.5				73.3	0.0	73.3	883.5	
1-10	28.8				72.5	0.0	72.5	874.4	
1-11	30.0				72.0	0.0	72.0	868.4	
1-12	31.8				72.0	0.0	72.0	868.4	
1-13	40.0				72.0	0.0	72.0	868.4	
1-14	48.8				71.0	0.0	71.0	856.3	
1-15	58.8	1.3	56.5	679.7	56.4	0.0	56.4	679.9	15281
1-17	26.2				71.5	0.0	71.5	867.2	
1-18	34.4				71.1	0.0	71.1	857.3	
1-19	49.7				71.2	0.0	71.2	858.7	
1-20	73.4	1.0	72.4	866.6	71.2	1.0	70.7	852.6	17678
1-21	23.4	1.0	22.4	268.1	76.2	1.0	75.2	906.9	18262
1-24	69.9	1.0	68.9	824.7	69.4	1.0	68.4	824.9	18344
1-25	12.3	1.0	11.3	135.3	62.3	9.3	53.0	639.2	19034
1-26	17.4	1.0	16.4	196.3	70.9				19477

Leachate This Sheet	4471	Distribution This Sheet	23948
Leachate Prior Sheet	0	Distribution Prior Sheet	0
Total Leachate	4471	Total Distribution	23948

*8,063 gallons of rain water added during refuse placement.
1,500 gallons of leachate generated during refuse placement.

PLATE H-26 A

FLUID ROUTING CELL"D"

Date	Leachate Collection Start (In)	Leachate Collection End (In)	Leachate Collection Total (In)	Leachate Collection Total (Gal)	Distribution Start (In)	Distribution End (In)	Distribution Total (In)	Distribution Total (Gal)	Fluid Ret. In Refuse
1972						0.0	70.9	855.1	
1-27	27.3	1.0	26.3	314.8	72.5	10.9	61.6	742.9	20017
1-28	33.4	1.0	32.4	387.8	70.7	0.0	70.7	852.6	20372
1-31	81.5	2.0	79.5	951.6	72.5	0.0	72.5	875.0	20273
2-1	16.5	1.0	15.5	185.5	70.5	0.0	70.5	850.9	20963
2-2	22.4	1.0	21.4	256.2	71.6	0.0	71.6	864.1	21557
2-3	42.8	1.0	41.8	500.3	45.1	0.0	45.1	544.3	21921
2-4	42.0	1.0	41.0	490.7	43.1	0.0	43.1	520.2	21975
2-7	81.4	2.0	79.4	950.4	72.3	12.3	60.0	724.1	21545
2-8	16.5	1.0	15.5	185.5	71.4	2.0	69.4	837.6	22083
2-9	20.6	1.0	19.6	234.6	72.9	11.0	61.9	747.1	22686
2-10	41.6	2.0	39.6	474.0	72.8	14.8	58.0	700.0	22959
2-11	47.6	1.0	46.6	557.8	70.2	15.3	54.9	662.6	23102
2-12	48.2	1.0	47.2	564.9	65.3	13.5	51.8	625.2	23199
2-13	47.5	1.0	46.5	556.6	62.4	22.0	40.4	487.6	23268
2-14	31.8	1.0	30.8	368.7	73.0	19.3	53.7	648.1	23387
2-15	40.6	1.0	39.6	474.0	73.1	23.3	49.8	601.0	23561
2-16	39.2	1.0	38.2	457.3	72.1	19.7	52.4	632.4	23705
2-17	42.6	1.5	41.1	492.0	71.1	21.1	50.0	603.5	23845
2-18	42.6	1.0	41.6	497.9	71.2	19.0	52.2	630.0	23951
2-19	43.3	1.0	42.3	506.3	72.6				24074

Leachate This Sheet	1407	Distribution This Sheet	14004
Leachate Prior Sheet	4471	Distribution Prior Sheet	23948
Total Leachate	13878	Total Distribution	37952

PLATE H-26 B

FLUID ROUTING CELL"D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972									
						21.4	51.2	617.9	
2-20	41.3	1.0	40.3	482.4	72.5				24210
						23.4	49.1	592.6	
2-21	37.5	1.0	36.5	436.9	72.9				24365
						28.2	44.7	539.5	
2-22	33.7	1.0	32.7	391.4	72.3				24514
						31.6	40.7	491.2	
2-23	37.8	2.0	35.8	428.5	81.0				24576
						1.0	80.0	965.5	
2-24	52.4	11.8	40.6	485.9	72.7				25056
						1.0	71.7	865.3	
2-25	46.7	2.0	44.7	535.1	72.3				25386
						1.0	71.3	860.5	
2-26	58.9	1.0	57.9	693.1	72.3				25553
						1.0	71.3	860.5	
2-27	50.9	1.0	49.9	597.3	72.5				25817
						1.0	71.5	862.9	
2-28	55.3	2.0	53.3	638.0	72.3				26042
						1.0	71.3	860.5	
2-29	62.3	1.0	61.3	733.8	72.1				26168
						1.0	71.1	858.1	
3-1	60.5	2.0	58.5	700.2	72.8				26326
						1.0	71.8	866.5	
3-2	60.8	2.0	58.8	703.8	72.6				26489
						1.0	71.6	864.1	
3-3	60.8	3.0	57.8	691.9	72.8				26661
						0.0	72.8	878.6	
3-4	66.5	2.0	64.5	772.1	72.9				26768
						1.0	71.9	867.8	
3-5	59.9	2.0	57.9	690.7	72.9				26945
						1.0	71.9	867.8	
3-6	61.0	2.0	59.0	706.2	72.9				27106
						1.0	71.9	867.8	
3-7	64.5	1.0	63.5	760.1	73.0				27214
						1.0	72.0	868.9	
3-8	60.7	2.0	58.7	702.6	72.9				27380
						1.0	71.9	867.8	
3-9	59.7	3.0	56.7	678.7	72.8				27569
						1.0	71.8	866.5	
3-10	60.7	2.0	58.7	702.6	73.0				27733
						1.0	72.0	868.9	

Leachate This Sheet	12531	Distribution This Sheet	17059
Leachate Prior Sheet	13878	Distribution Prior Sheet	37952
Total Leachate	26409	Total Distribution	55011

PLATE H-26 C

FLUID ROUTING CELL"D"

Date	Leachate Collection				Distribution				Fluid Ret. In Refuse
	Start (In)	End (In)	Total (In)	Total (Gal)	Start (In)	End (In)	Total (In)	Total (Gal)	
1972									
3-11	58.4	1.0	57.4	687.1	73.0				27915
						1.0	72.0	868.9	
3-12	55.0	1.0	54.0	646.4	72.9				28138
						1.0	71.9	867.8	
3-13	54.8	1.0	53.8	643.9	73.0				28361
						1.0	72.0	868.9	
3-14	61.1	1.0	60.1	719.4	72.9				28511
						1.0	71.9	867.8	
3-15	59.6	1.0	58.6	701.4	73.0				28677
						1.0	72.0	868.9	
	Leachate adjustment for pumping operation			1506.5					28040

Leachate This Sheet	4905	Distribution This Sheet	4343
Leachate Prior Sheet	26409	Distribution Prior Sheet	55011
Total Leachate	31314	Total Distribution	59354

PLATE H-26 D

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added: Meter Reading	Fresh Water Added: Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
3-15-72	000	889	000	111	1000	28151
3-16-72	889	673	1000	127	800	28278
3-17-72	1673	5117	1800	183	5300	28461
3-24-72	6917	1290	7100	230	1520	28691
3-26-72	8390	1301	8620	319	1620	29010
3-28-72	9921	1403	10240	317	1720	29327
3-30-72	11643	1392	11960	278	1670	29605
4-1-72	13352	3765	13630	405	4170	30010
4-5-72	17395	1774	17800	213	1987	30223
4-7-72	19574	2264	19787	249	2513	30472
4-10-72	22051	833	22300	167	1000	30639
4-11-72	23133	3120	23300	0	3120	30639
4-14-72	26420	6652	26420	378	7030	31017
4-21-72	33072	8928	33450	0	8928	31017
4-28-72	42378	9882	42378	0	9882	31017
5-8-72	52260	2287	52260	213	2500	31230
5-11-72	54547	4302	54760	338	4640	31568
5-17-72	59062	3882	59400	518	4400	32086
5-23-72	63282		63800			

Leachate This Sheet	59754	Distribution This Sheet	63800
Leachate Prior Sheet	31314	Distribution Prior Sheet	59354
Total Leachate	91068	Total Distribution	123154

PLATE H-26 E

FLUID ROUTING CELL "D"

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added: Meter Reading	Fresh Water Added: Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
		6153		497	6650	32583
5-31-72	69953	7577	70450	373	7950	32956
6-9-72	78027	4947	78400	570	5517	33526
6-16-72	83347	5596	83917	555	6151	34081
6-23-72	89513	5054	90068	508	5562	34589
6-29-72	95122	3840	95630	150	3990	34739
7-3-72	99470	4950	99620	180	5130	34919
7-10-72	104570	7467	104750	503	7970	35422
7-18-72	112217	6700	112720	200	6900	35622
7-25-72	119420	6060	119620	270	6330	35892
8-1-72	125680	6103	125950	147	6250	36039
8-9-72	132053	4068	132200	332	4400	36371
8-14-72	136268	7144	136600	156	7300	36527
8-22-72	143744	7019	143900	531	7550	37058
8-30-72	150919	5025	151450	295	5320	37353
9-5-72	156475	8797	156770	1240	10037	38593
9-18-72	165567	5243	166807	690	5933	39283
9-27-72	172050	3404	172740	1061	4465	40344
10-3-72	176144	4756	177205	2039	6795	42383

Leachate This Sheet	109903	Distribution This Sheet	120200
Leachate Prior Sheet	91068	Distribution Prior Sheet	123154
Total Leachate	200971	Total Distribution	243354

PLATE H-26 F

FLUID ROUTING CELL 'D'

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added: Meter Reading	Fresh Water Added: Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
10-10-72	181961		184000			
		9070		0	9070	42383
10-19-72	193070		193070			
		16640		2840	19480	45223
11-7-72	209710		212550			
		15340		0	15340	45223
11-16-72	227890		227890			
		21860		0	21860	45223
11-27-72	249750		249750			
		13160		0	13160	45223
12-6-72	262910		262910			
		7940*		-2400*	5540	42823
12-11-72	268450		268450			
		5570		0	5570	42823
12-18-72	274020		274020			
		19530		0	19530	42823
12-26-72	293550		293550			
		20740		0	20740	42823
1-4-73	314290		314290			
		15290		0	15290	42823
1-11-73	329580		329580			
		27770		0	27770	42823
1-18-73	357350		357350			
		34810		0	34810	42823
1-26-73	392160		392160			
		26480		0	26480	42823
2-1-73	418640		418640			
		32130		0	32130	42823
2-8-73	450770		450770			
		33660		0	33660	42823
2-15-73	484430		484430			
		34130		0	34130	42823
2-22-73	518560		518560			
		33000		0	33000	42823
3-1-73	551560		551560			
		33290		0	33290	42823
3-8-73	584850		584850			
Leachate This Sheet		400410	Distribution This Sheet		400850	
Leachate Prior Sheet		200971	Distribution Prior Sheet		243354	
Total Leachate		601381	Total Distribution		644204	

* 2,400 gallons leachate lost on Dec. 9, 1972, due to frozen leachate return line.

PLATE H-26G

FLUID ROUTING CELL 'D'

Date	Leachate Collection		Distribution (Leachate & Fresh Water)			Fluid Retained in Refuse (4+6)
	Meter Reading	Total Gal. Leachate Generated (1-3)	Fresh Water Added: Meter Reading	Fresh Water Added: Gallons Added (3-1)	Total Distribution (4+2)	
	1	2	3	4	5	6
		30570		0	30570	42823
3-15-73	615420		615420			
		26180		0	26180	42823
3-22-73	641600		641600			
		23300		0	26180	42823
3-29-73	664900		664900			
		19120		0	19120	42823
4-5-73	684020		684020			
		13560		0	13560	42823
4-12-73	697580		697580			
		8540		-400 *	8540	42423
4-19-73	706120		706120			
		6607		233	6840	42656
4-26-73	712727		712960			
		5643		307	5950	42963
5-3-73	718603		718910			
		5882		158	6040	43121
5-10-73	724792		724950			
		4991		429	5420	43550
5-17-73	729941		730370			
		4028		182	4210	43732
5-24-73	734398		734580			
		6193		567	6760	44299
5-31-73	740773		741340			
		6000		800	6800	45099
6-7-73	747340		748140			
		7257		418	7675	45517
6-14-73	755397		755815			
		6571		764	7335	46281
6-21-73	762386		763150			
		5402		98	5500	46379
6-28-73	768552		768650			
		5949		1361	7310	47740
7-5-73	774599		775960			
		5300		630	5930	48370
7-12-73	781260		781890			
		3890		490	4380	48860
Leachate This Sheet		19493	Distribution This Sheet		201420	
Leachate Prior Sheet		601381	Distribution Prior Sheet		644204	
Total Leachate		796364	Total Distribution		845624	

* 400 gallons leachate lost due to equipment failure.

PLATE H-26 H

APPENDIX I

Test Cell Refuse Placement History

TEST CELL REFUSE PLACEMENT HISTORY

CELL A

DATE	EVENT	ADDED LIQUID	RAINFALL
11/ 5/71	Started Placing Refuse		
11/12/71	Rain		0.29"
11/13/71	Rain		0.25"
11/15/71	Finished Placing Refuse (530.35 Tons)		
11/15/71	Started Placing Cell Cover		
11/16/71	Rain		0.02"
11/17/71	Cell Cover in Place		
11/22/71	Shot Initial Settlement Elevation		
	Compacted Refuse Density 1064 #/yd^3		

TEST CELL REFUSE PLACEMENT HISTORY

CELL B

DATE	EVENT	ADDED LIQUID	RAINFALL
11/16/71	Started Placing Refuse		
11/19/71	Switched Refuse Placement to Cell E		
11/24/71	Resumed Refuse Placement		
11/29/71	Rain		0.96"
12/ 1/71	Finished Placing Refuse (524.23 Tons)		
12/ 2/71	Rain		0.50"
12/ 3/71	Rain		0.32"
12/ 6/71	Rain		0.24"
12/ 6/71	Add Water from Water Truck	20,000 gal.	
12/ 7/71	Add Water from Water Truck (69.25" in tank D as run off from Cell B. 69.25" = 829 gallons)	14,000 gal*	
12/ 8/71	Started Placing Cell Cover		
12/ 9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/10/71	Cell Cover in Place		
	Compacted Refuse Density 1052 #/yd^3		
	*14,000 gallons should be reduced by 829 gallons to determine total moisture added to cell		

TEST CELL REFUSE PLACEMENT HISTORY

CELL C

DATE	EVENT	ADDED LIQUID	RAINFALL
12/ 1/71	Started Placing Refuse		
12/ 2/71	Rain		0.50"
12/ 3/71	Rain		0.32"
12/ 3/71	Switched Refuse Placement to Cell E		
12/ 6/71	Rain		0.24"
12/ 6/71	Resumed Placing Refuse		
12/ 7/71	Add Water from Water Truck (2,000 gal ran through the cell and out the tank)	4,000*	
12/ 9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/11/71	Rain		0.03"
12/13/71	Rain		0.77"
12/13/71	Add Water from Water Truck	4,000 gal.	
12/13/71	Finished Placing Refuse (521.72 tons)		
12/13/71	Began Placing Muck Sand		
12/15/71	Rain		0.05"
12/17/71	Started Placing Distribution System		
12/21/71	Started Placing Cell Cover		
12/21/71	Cell Cover in Place		
12/21/71	405 gal. Leachate pumped from bottom tank and discarded	- 405 gal.	
	Compacted Refuse Density 1064 #/yd^3		
	*4,000 gallons should be reduced by 2,000 gallons to determine total moisture added to cell.		

TEST CELL REFUSE PLACEMENT HISTORY

CELL D

DATE	EVENT	ADDED LIQUID	RAINFALL
12/13/71	Started Placing Refuse		
12/15/71	Rain		0.05"
12/22/71	Rain		0.51"
12/23/71	Rain		0.22"
12/23/71	Finished Placing Refuse (530.97 Tons)		
12/24/71	Rain		0.06"
12/27/71	Rain - Leachate Collection Tank at bottom of Cell D was full and overflowing. Leachate held for recycling. Estimated volume, 1,500 gal.	- 1,500	1.77"
12/28/71	Pea Gravel Placed for Distribution System		
12/29/71	Rain		0.03"
12/29/71	Distribution System Installed		
12/29/71	Started Placing Cell Cover		
12/30/71	Cell Cover in Place		
	Compacted Refuse Density 1065 #/yd^3		

TEST CELL REFUSE PLACEMENT HISTORY

CELL E

DATE	EVENT	ADDED LIQUID	RAINFALL
11/15/71	Started Placing Refuse		
11/16/71	Rain		0.02"
11/16/71	Septic Pumpings	1,000 gal	
11/16/71	Switched Refuse Placement to Cell B(@Ton 180.2)		
11/17/71	Septic Pumpings	1,000 Gal	
11/18/71	Septic Pumpings	800 Gal	
11/19/71	Septic Pumpings	2,200 Gal	
11/22/71	Resumed Refuse Placement		
11/22/71	Septic Pumpings	2,200 Gal	
11/23/71	Septic Pumpings	1,000 Gal	
11/24/71	Switched Refuse Placement to Cell B(@ Ton 424)		
11/29/71	Rain		0.96"
11/30/71	Septic Pumpings	2,200 Gal	
12/1/71	Septic Pumpings	2,600 gal	
12/2/71	Septic Pumpings	1,000 gal	
12/2/71	Rain		0.50"
12/3/71	Rain		0.32"
12/3/71	Resumed Refuse Placement		
12/3/71	Septic Pumpings	1,000 gal	
12/6/71	Rain		0.24"
12/6/71	Septic Pumpings	2,000 gal	
12/6/71	Finished Placing Refuse (521.93 Tons)		
12/7/71	Septic Pumpings	3,800 gal	
12/8/71	Septic Pumpings	2,100 gal	
12/9/71	Rain		0.27"
12/10/71	Rain		0.09"
12/10/71	Septic Pumpings	3,300 gal	
12/10/71	Started Placing Cell Cover		
12/11/71	Rain		0.03"
12/11/71	Septic Pumpings	1,000 gal	
12/12/71	Cell Cover in Place		
	Refuse Density 1047 #/yd^3		

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*All references except those marked with an asterisk have been verified by the Office of Solid Waste Management Programs.